FLIGHT and The AIRCRAFT ENGINEER

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The Outlook

Feline Exodus

SIR ARCHIBALD SINCLAIR, the Secretary of State for Air, let several cats out of the bag in his Air Estimates speech. That he felt justified in so doing may be accepted as a sign of confidence, for if we had but one or two specimens of the new types, Sir Archibald would scarcely have referred to them in the specific way he did. Thus one may take it that by now they are available in considerable numbers. That this is so seems to be further indicated by the Air Minister's statement that the Stirling, Manchester, and Halifax bombers "have already shown their worth against enemy targets."

If one is a little puzzled by Sir Archibald's description of the new bombers as "more than twice the size of any earlier type," there is no ambiguity in his statement that they can carry "three times the weight of bombs for the same distance as their predecessors."

Two other "cats" released by the Air Minister were of especial interest. The fact that the Hawker Tornado has an engine of "nearly twice the power of the fighters which bore the brunt of the Battle of Britain" points to the 2,000 h.p. engines which Mr. J. C. Hunsaker thought were the prerogative of the United States (see Leaders in last week's issue), and Sir Archibald's revelation that the speed of the Tornado is "well in excess of 400 m.p.h." will we are sure, be welcomed by Mr. Hunsaker and his compatriots as heartily as it is by ourselves. Mr. Hunsaker claimed two American engines of the 2,000 h.p. class. Sir Archibald Sinclair revealed that, in addition to the engine of the Tornado (which is known to be a Rolls-Royce, although he did not state this fact on this particular occasion), "other engines of as great or even greater power are coming on."

In the new fighter class Sir Archibald, after mentioning the Westland Whirlwind, made the first official reference to a twin-engined Bristol, the Beaufighter, "for long-range fighter operations and for night fighting." From the name one might infer that this new formidable twin-engined fighter, which has recently done well in bringing down enemy night bombers, owes its ancestry to the Bristol Beaufort.

Facts and Opinions

DURING the debate on the Air Estimates a subject was discussed which was of very particular interest to *our* readers, and as little reference has been made to it in the daily Press, we feel we owe it to them to record at least an outline. Mr. Garro Jones expressed his concern at "the publication in technical journals of facts and opinions of operational value to the enemy."

Among the articles to which the Member for Aberdeen, North, took exception was the one published in our issue of March 6th, entitled "The Case for the Carburettor." That article was written by a member of the technical staff of the Rolls-Royce firm, and had been submitted to and passed for publication by the Air Ministry before being sent to us. We published the article, although we did not altogether accept the conclusions reached by the writer; and apparently others share our doubts, as will be shown by a reference to our Correspondence page in this issue.

"The journals concerned," Mr. Garro Jones said, "are extremely powerful and resist restraint; indeed, throughout they have successfully resisted restraint." And again, a little later: "No restriction is placed on what can be said in aviation journals." Ye gods and little fishes! That just shows how little the Member for Aberdeen, North, knows of technical journalism, or else he was speaking with his tongue in his cheek and indirectly arguing in favour of compulsory censorship.

Barking Up the Wrong Tree

QUITE frankly, we feel that Mr. Garro Jones's allegation that the technical Press resists restraint should be withdrawn. Quite recently *Flight* submitted a contributed article to the Censors. The article came back, passed for publication except for certain very small "cuts." We were, however, informed that the Air Advisor considered the whole article undesirable. We immediately informed the Censors that if that was the case we would certainly not publish it.

Just one more example will serve to show how far Mr. Garro Jones was "off the rails" so far as *Flight* is concerned. Not very long ago a photograph came into this office. It showed an aircraft of well-known and somewhat ancient vintage, and had been passed for publication by Censor. The aircraft was flying above what was a "prohibited area" even in peacetime, and as we felt sure that a mistake had been made, we immediately consulted the department. As we surmised, the part of the picture showing the aircraft *had* been passed, but not that part which showed the prohibited area. The whole area covered by the negative had been included, by mistake no doubt, when the prints were sent out. Steps were taken to recall all prints.

In his reply, Capt. Harold Balfour assured Mr. O. E. Simmonds that the technical journals had shown themselves entirely helpful, and added that since last autumn there had been no case of giving away, unwittingly, any damaging information. (Mr. Simmonds' question was whether "the editors of these aeronautical and technical papers had shown themselves anxious and ready to understand the Air Ministry's point of view and to fall in with it.")

Research and Development

ONE subject which came in for a good deal of debate was that of research and technical development. The question of the resignation or non-resignation of Sir Henry Tizard was the pivot around which the debate mainly centred, but it soon became quite obvious that there was an undercurrent of general uneasiness concerning certain aspects of the working of the Ministry of Aircraft Production.

Whether or not Sir Henry Tizard resigns is, perhaps, not a matter of vital importance to the national war effort. What *is* important is that research and technical development should be pursued with the same vigour as that applied to production.

When the Ministry of Aircraft Production was set up it was generally accepted that it would, as its title implied, deal with production only; that is to say, with the quantity manufacture of aircraft, engines and equipment. That seemed logical. But the planning of new types, the long-range policy, might suitably have remained under the Air Ministry. After all, it must be for the service chiefs to say what they want in the way of equipment in order to enable the R.A.F. to carry out its functions with the greatest effectiveness.

It appears that the Ministry of Aircraft Production has been given or has taken unto itself—we are not sure which—powers and functions not originally envisaged. That all is not well seems to be indicated by the long list of eminent experts from almost every sphere who have at one time and another been called to the M.A.P. but who have left again, one by one. Not all of them have left because of disagreements, of course. For instance, Sir Charles Bruce-Gardner, chairman of the S.B.A.C., has returned to the Society because it was felt that he could serve the national interest more effectively there, although his excellent work in the M.A.P. has received eloquent official appreciation. But it cannot be supposed that all the clever men had equally impersonal reasons for leaving the Ministry.

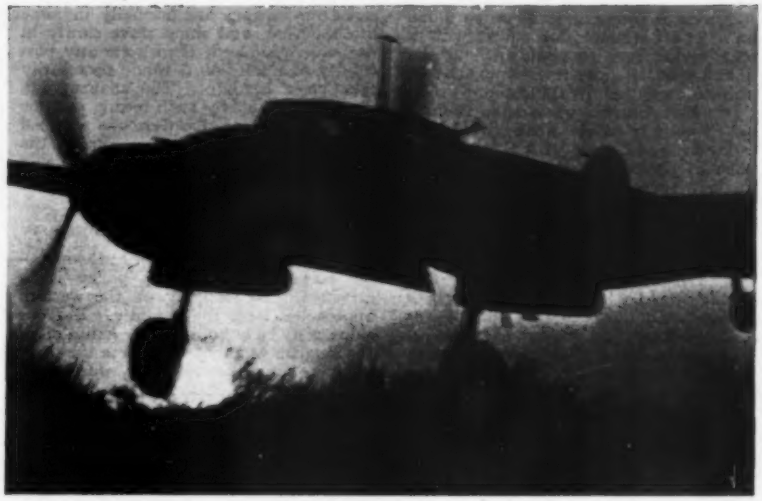
AIRLINE CENTRE. Several of the major airlines of U.S.A. have combined to erect a New York booking and passenger dispatch office. This six-storey building is in Manhattan and is used by American, United, T.W.A., Pan American, Canadian Colonial and Eastern Air Lines. Passenger formalities are attended to in this escalatored booking hall, which is decorated in modern manner.

War in the Air

Moonlight Nights : The Beaufighter Scores : New R.A.F. Bombers Over Berlin

WITH the passing of wintry weather the night bombing season has now once more got into full swing. In one raid a bomb hit the North Lodge of Buckingham Palace and killed a policeman, while three more fell in the front court. There have been heavy raids on Portsmouth, the North-West and the Midlands, besides plenty of indiscriminate heaving of bombs down at random. The R.A.F., for its part, has made heavy raids on Berlin, Cologne, Kiel, and other places.

To the student of air warfare a mere bombing match is not very interesting. Interest is aroused when one can discern some ordered plan behind the operations, for then one can at least speculate on whether they are likely to have any appreciable effect on the result of the war. German bombing of the kind which is intended to help the enemy's efforts to blockade us by cutting down our imports may cause some anxiety, but it is not devoid of interest. The same may be said of calculated shots at our munition factories. But the broadcasting of bombs on residential areas, though it causes many heartbreaking tragedies, has no military interest, for it will not break the British will to win. As for the British air attacks on Germany's war effort, it is certain that they are hampering production and distribution, but whether to an extent which will really put a brake on the fighting powers of the German forces is not yet known. The enemy would certainly be stronger if the R.A.F. were not hammering those targets, but whether the diminution of his strength is enough as yet to have any considerable effect on the final result of the war cannot be stated with certainty.



ALL IS LOST!: The German inscription to this photograph reads: "The tremendous development of German anti-aircraft forces makes the flight of British bombers to German territory and the destruction of important industrial plants practically impossible, as neutral experts have ascertained time and time again. The photograph shows the start of German destroyer planes for the defence against British night bombers, whose coming has been reported." To us the picture appears to be just an Me 110 with flaps fully down and engines ticking over coming in to land. Our fighters *take off* when the Luftwaffe arrives.

There is, however, some tactical interest in recent night operations. It relates to weapons and their use. The number of German night bombers which have been brought down is rising. Of late we have heard of figures of eight and nine a night. It has been admitted that we are using new devices. Naturally they have not been disclosed, but it is obvious that something has been helping our defences. The bright moonlight is one factor which helps the defence, though it probably helps the attack even more. Night fighters have more chance of glimpsing the bombers when the moon is bright. German night-fighters have also been prominent of late, but have not achieved any striking successes. Night defence is a matter in which we are clearly in advance of the enemy—though that is not to say that he will not get more success in the long run than he has had up to date.

Among the R.A.F. night fighters which have scored successes there have been mentions of the Bristol twin-engined Beaufighter and the Defiant. As recorded on page 222 of this issue, Sir Archibald Sinclair has stated that the Douglas Boston was suitable for night-fighting, but it has not been mentioned as among the victorious defenders in recent night operations. The Beaufighter, however, signalised its addition to British night defences by shooting down two Ju 88s last week. One of them was stalked for some time by the British pilot after he had sighted it in the clear moonlight, and when he at last closed with

TAXI!: A Squadron Leader (left) recounting the story of how he brought a captured Caproni 133 with its Italian pilot and crew back to an R.A.F. station in the Sudan. A stop was made at an aerodrome en route to pick up a wounded airman and mails.

WAR IN THE AIR (Continued)

it he had to fire only two bursts. At once there was an explosion and a burst of flame all along the fuselage of the Junkers. It began to dive, and the British pilot followed it down to 6,000 feet. The German pilot ended with a steep diving turn to starboard, hit the ground vertically and then exploded. It came to earth near Warminster.

The British raids on Berlin, Bremen and Hamburg last week were the heaviest which the R.A.F. has yet launched against Germany. Several of the new types of bomber were in use, and they carried very heavy bombs. The moonlight made the task of our bomber crews easy, so far as identifying their targets went, and they defied furious *flak* to make sure of their aim. One machine was held in searchlights for half an hour, and the pilot said that it was the longest half-hour he had ever known. None the less, that machine got back home. Some losses were suffered by our bombers, but they were not heavy in proportion to the size of the raid. The Me 110s which tried to act as night defenders did not escape scatheless.

British Mine-laying

THE operations of the R.A.F. at night are not confined to bombing. One of its important activities is laying sea mines. From Norway and the Baltic to the Mediterranean, there are few ports, estuaries or shipping channels in enemy use that have escaped the attention of R.A.F. mine-layers. The operations have been outstandingly successful, although for military reasons it is not possible to reveal full details of the location or the number of successes obtained. It can be stated as an indication of results, however, that in less than ten per cent. of the total minefields laid by the R.A.F. and the Fleet Air Arm, well over 100 ships engaged in supply to the enemy are known to have been destroyed. Among these losses were enemy war vessels and troop ships, by the destruction of which the German forces have suffered heavy casualties in personnel. In addition, the repeated mining of the Kiel Canal by the Royal Air Force has seriously embarrassed the movements of the enemy's naval and mercantile craft.

The first admission of damage in the Canal was made in a foreign broadcast on July 29, 1940, when it was stated that the Canal itself had been so badly hit that ships could only pass through it with great difficulty and long delays. During August and September these difficulties persisted, and in November the mining of a ship in the Canal made navigation even slower and more complicated. In December a ship laden with iron-ore was sunk in the Canal, and air reconnaissance clearly revealed the obstruction. There could be no obstacle more difficult to clear than a sunken ship with such a cargo. Throughout this period, even when the Canal was not completely blocked, it has only been open to passage by the smallest ships. The Canal bottom was damaged when the vessel sank and one embankment collapsed.

Various excuses, ranging from the ingenious to the ludicrous have been advanced by the Germans to explain away the difficulties of transit. At one period collision was blamed. This obviously was not convincing. Very strict precautions are normally in force in the Canal, and ships move slowly in transit. If, indeed, there were any possibility of a collision it would necessarily take place head-on. The chance of a ship being sunk by such means may be dismissed. Later, the Germans ascribed the damage to sabotage. Finally the Germans solemnly declared that one of the bridges over the Canal had fallen on a ship, and sunk it.

Balloons on Channel Convoy

THE main effort of the *Luftwaffe* in helping the blockade policy is to attack British shipping on the western approaches from the Atlantic. But our ships also have to run the gauntlet of the English Channel, and there the dive-bombers are apt to come into play. Many of the Ju 87 type have been sent off to Bulgaria and Sicily, but there is still a residue on the aerodromes in Northern France. Mines add to the excitement of the passage up the Channel. The following extracts are taken from the log of an R.A.F. officer in a balloon barrage ship, who has escorted many convoys up the Channel.

"0950 hours. Mine sighted on port bow necessitating sudden change of course. This was followed by sighting other mines on the starboard bow, until eventually we zig-zagged through 23 of them. Obviously they had broken loose during the storm."

"1105 hours. An Me 109 made two machine-gun attacks on '——.'" Shooting bad and no hits. '——' attacked by four dive-bombers. Bombs could be seen hitting the sea beside the ship."

"1856 hours. Vivid flashes from French coast."

"2143 hours. Enormous flash from French coast followed some eighty seconds later by the sound of heavy explosion."

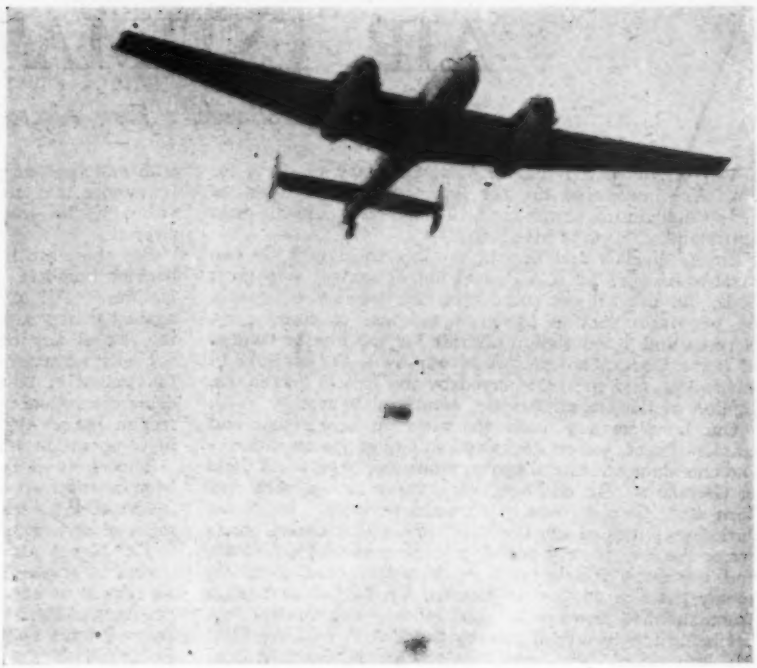
"2224 hours. A.A. fire from French coast. Throughout the night there was a series of flashes and occasional A.A. fire from both coasts."

"Thursday. 0220 hours. This has been written subsequently as things moved too fast to record them at the time. I came below to call my relief and as I came on deck again I was told that a motor boat had been heard on our port bow and had disappeared. About five minutes later there was an explosion astern followed immediately by another. Immediately the place seemed to become like a Brock's firework display. Everybody who had anything seemed to let it off. Tracers showing up scarlet in the night were returned by bullets which appeared green in colour. We kept dead quiet. The trouble was about, or appeared to be about, a quarter of a mile astern and we were in a position that we could do nothing effective if we did open fire. What actually happened we shall not know till we reach port, but the motor torpedo boat brigade were putting up flares all over the place. Presently we heard a 'phew'—almost next door it seemed, but whatever it was it did not find its mark. After what seemed hours, but was only a few minutes, it seemed that the firework party was falling astern. Personally I heaved a sigh of relief. By the gun flashes and rattle of machine guns I knew our escort was doing its stuff. But suddenly right on our starboard beam two high flares shot up and came sailing down lighting '——' and ourselves as clear as day. There followed what we all expected . . . a sickening thud. We thought the '——' had got it. Then there was another lull followed by the usual cries of 'There she is' as machine guns opened up again and flares showed us up. Suffice it to say that I think all of us were glad when dawn broke and we could see 'where the next one was coming from.' One must feel sorry, I think, for anyone who is powerless to help either himself or others, and while the merchantman is worse off, as he is bound to be the first target, my immediate thoughts could only be for our lads. Our R.A.F. crew, needless to say, are splendid. With all the excitement last night when I went aft, I hardly expected to find anyone at the winch. But there he was—our man who shall be nameless."

"1155 hours. This looks bad. About thirty Junkers 87s with an escort of Messerschmitt 109s arrived over the convoy. The procedure is simple. The fighters try to put the balloons down in flames and, like one platoon following another on the parade-ground, the dive-

MANY HAPPY RETURNS: Italian bombs left at Tobruk which will doubtless be handed back shortly.

WAR IN THE AIR (Continued)



CLOSE-UP OF AGGRESSION: A Messerschmitt Me 110 dropping its load. This usually consists of four 250 kg. bombs. In this view the ducted radiators, outboard of the Daimler Benz engines, are very apparent.

bombers follow. Whether they saw something we didn't, I don't know, but the bombers suddenly veered away, and that was that. But not before our fighters had got a couple of Junkers, and possibly a third."

"1845 hours. Alongside quay. Tied up."

A trip on which there are fewer than 20 shells from the German batteries on the French coast is regarded as uneventful. And there was one occasion towards the end of last year when a near miss actually severed the balloon cable.

In the Middle East

ITALIAN Somaliland can now be regarded as conquered by our troops, and ground operations there have recently been described as "mopping up." General Cunningham is using that colony as a base for yet one more invasion of Ethiopia, and (such is the irony of history) is following fairly closely in the footsteps of Graziani during the Italian invasion of that country. One has almost lost count now of the various routes by which British columns and bands of Ethiopian Patriots under British leaders are driving the Italian garrisons back towards Addis Ababa. Wherever they go the R.A.F. and the S.A.A.F. are in attendance, scouting and bombing, with machine-gun attacks on columns whenever they are spotted.

The strong position of Burye fell to the Abyssinian Patriots, led by one English and one Australian officer, after it had been heavily bombed by the R.A.F. The Italians tried a desperate sortie, which failed, and then evacuated the place and commenced a hazardous retreat in the direction of Addis Ababa, harassed all the way by the Abyssinians, who are now fighting in the style for which they are fitted, namely, as guerillas. When they come up against fortified posts the help of our aircraft is invaluable, as the bombers play the part of artillery, which is necessarily a weak arm with a jungle force.

We have not actually heard of supplies being dropped for the troops from the aircraft, probably because that has not been necessary, but the troops know that there is always that source of supply on which they can fall back in case of need.

The pace of the British advance in Eritrea slowed up. It is the oldest Italian colony, and the Africans there are said to be loyal to their rulers. Keren is a strong place, and British tactics aim at reducing it without heavy casualties to the British and Indian troops. It was always expected that Eritrea would be the toughest nut in the Italian Empire for us to crack. But the aircraft must have made the road between Keren and Asmara a very unhealthy place. It is still hoped that the Italian tricolour will cease to wave in any part of East Africa before the next rainy season sets in.

It was skilful use of motor transport and unscrupulous use of aircraft which enabled the Italians to overrun the Empire of the Negus in a short campaign (though the tactics of the Ethiopians played into their hands), and it must now be very galling to the Italian soldiers to see those same two weapons playing the chief part in the downfall of their régime.

Outside East Africa British activities, up to the moment of writing, have been confined to the air. Of course the Navy is busy, as always, but most of its work is done without regular communiqués. Our aircraft have been bombing Tripoli, directing their aim against its harbour and aerodrome for the most part, and also attacking other aerodromes in the Province of Tripolitania.

The gallantry with which Malta has faced its ordeals has been rewarded by the King, who has promoted the acting Governor, Maj. Gen. Dobbie, to be a Knight Commander of the Bath. That is an honour for the whole island.

There has been a fierce battle in Albania. It has been rumoured that Mussolini went there in person to spur his troops on. It was natural that the Italians should make an effort there before the Germans advanced through Bulgaria, for the double purpose of pressing the Greeks hard on both fronts and at the same time showing the Senior Partner that things were not so very bad with the Juniors after all. However, the Greeks held their ground, and the Italian losses were sanguinary and without avail. Naturally, the R.A.F. plunged into this fray with relish. In one affair a patrol of our fighters (number not stated) met a formation of enemy bombers escorted by more than 50 fighters. Our men attacked at once and shot down 14, besides damaging others, without loss to ourselves.

There have been renewed bombing attacks on aerodromes in Rhodes.

The captain of a Clan liner has sent this letter to a Naval Control Officer:—"As a shipmaster I wish to express my appreciation of the wonderful work being done by the Coastal Command of the R.A.F., especially the crews of the Sunderland flying boats. On arriving at ——— from overseas I had another chance of seeing the R.A.F. at work by day and by night and to marvel at the skill they display in locating convoys hundreds of miles from the coast. The first flying boat to appear on this recent occasion found the convoy in the early hours of the morning while it was quite dark, and we still had, as escort, the pleasant company of a Sunderland at midnight the same day. I know it must be very monotonous at times to the men of the R.A.F. Coastal Command, being on patrol duty, but I would like them to know what a thrill it is to us seamen (I know I speak for all) to see them around us and what confidence it gives us. I would also say that we enjoy their company after trudging along at slow speed for twenty days' or more, it heartens us and is also a break in our monotony."

ENEMY AIR LOSSES TO MARCH 15th

	Over G.B.	Over Europe	Middle East
March 9	—	—	8
" 10	7	1	9
" 11	2	—	7
" 12	10	1	—
" 13	14	1	15
" 14	4	—	15
" 15	5	—	15
	42	4	69

Total in Northern Area, 4,313; Middle East, about 1,194.

BRITISH AIR LOSSES TO MARCH 15th.

	Over G.B. Aircraft	Over G.B. Pilots	Over Europe Aircraft	Middle East Aircraft
March 9	—	—	—	1 (pilot safe)
" 10	—	—	3	—
" 11	—	—	1	—
" 12	1	1	5	—
" 13	—	—	7	—
" 14	—	—	2	2 (pilots safe)
" 15	—	—	—	—
	1	1	18	3

Total in Northern Area, 1,783; in Middle East 124

AIR ESTIMATES

Sir Archibald Sinclair's Speech : New Aircraft Types Named

SIR ARCHIBALD SINCLAIR, Secretary of State for Air, introduced the Air Estimates in the House of Commons on March 11th. The following are the most important passages of his speech:—

Sir A. Sinclair said that in the last 10 months, in two theatres of war, the R.A.F. had fought against very great odds, but not without success, as the destruction, mainly by our incomparable fighter squadrons, of some 4,250 German and 1,100 Italian aircraft for the loss in combat of fewer than 1,800 aircraft of our own, the security of our shores, and the part played by the R.A.F. in the disruption of the Italian Empire, combined to testify.

Our bombers had made 260 raids on aerodromes and seaplane bases, 300 on docks and shipping, 470 on railways and communications and 630 on industrial targets—all these in Germany. In addition, very many heavy raids had been made on objectives in occupied territory. In all the varied activities of the Coastal Command, reconnaissance across the sea, convoy patrol, attacking warships, U-boats and merchant vessels, and photographing and bombing enemy bases in the last 10 months, aircraft of the Coastal Command had flown 16,000,000 miles. The air war was not being fought on our side by the R.A.F. and the Fleet Air Arm alone. The squadrons of Canada, South Africa, Australia, New Zealand and the Rhodesias, squadrons manned by men from India and Newfoundland and from all the Colonial Empire were playing their part in the battle.

A great and increasing element in our strength was contributed by the Air Force of our Allies—like the famous 303 Squadron of the Polish Air Force, which had, in the last six months, destroyed nearly 120 enemy aircraft.

The number of officers and men for which provision was taken for the coming year was not, of course, shown in the Estimates, but he could say that the strength of one R.A.F. Command alone exceeded the total peacetime strength of the R.A.F. by nearly 50 per cent. This expansion would be enormously accelerated during the year 1941-42.

The Minister of Labour had agreed that, broadly speaking, the Schedule of Reserved Occupations should not operate to prevent any man, whatever his occupation, from serving as a pilot or observer.

The Women's Auxiliary Air Force had proved itself an essential adjunct of the R.A.F.

We had accepted no reduction in the standard of training. The success of the Empire air training scheme had surpassed all expectations.

The Air Training Corps scheme, the first to cover the youth of the country as a whole, after 5½ weeks of existence, had 1,051 units. The total number of boys enrolled was over 130,000.

New Fighters and Bombers

Later models of Spitfires and Hurricanes (the right hon. gentleman continued) are now in service, fitted with more powerful engines which have considerably increased their speeds and provided the ability to fight at much greater heights, while heavier armament has increased their fire power. The new Hawker Tornado is equipped with engines of nearly twice the horse-power of the fighters which bore the brunt of the Battle of Britain, and can carry still heavier armament, and yet obtain speeds well in excess of 400 m.p.h. Other engines of as great or even greater power are coming on.

Then in the twin-engine fighter types we have the Whirlwind, and for long-range fighter operations and for night fighting the Beaufighter, each with a very heavy armament.

Of the bombers, the Hampdens, Wellingtons and Whitleys have in the past constituted the R.A.F.'s main offensive armament. The latest models of these are fitted with more powerful engines which give them increased performances and striking power. Some of them indeed, although the name remains, are really quite different aircraft.

But these are being replaced by a range of very much heavier bombers, including the Stirling, Manchester and Halifax. All of these have already proved their worth against enemy targets. These bombers are more than twice the size of any earlier type. They are faster, and carry not only a heavier defensive armament but also three times the weight of bombs for the same distance as their predecessors. Quality will also be maintained in the coastal reconnaissance types and in the types of aircraft employed in co-operation with the Army.

The effect of the war on civil aviation had inevitably been restrictive. We must not repeat after this war our failure after the last war to foster and stimulate the development of civil aviation.

The Royal Air Force was now on the threshold of its period of greatest expansion. During the next 12 months we should be absorbing in rapidly increasing numbers the products of British and American industry. The Harvard trainer, built by the North American Company, and the Lockheed Hudson general reconnaissance aircraft had proved the excellence and robustness of American design, and the latest make of Hudson had shown improvements upon its famous predecessor. The types of American aircraft which had reached units of the Royal Air Force throughout the world included such fighters as the Brewster Buffalo, and the Mohawk and Tomahawk built by the Curtiss Company, whose products were comparable with our single-engined types. The remarkable performance of American aircraft was well instanced by the Glenn Martin Maryland, a medium bomber which had shown its ability to outpace Italian fighters attempting to intercept it, and by another medium bomber, the Douglas Boston, which was sufficiently fast and manœuvrable for night-fighter operations as well as its designed function. Despite their speed both these aircraft were capable of carrying much heavier bomb loads than comparable bombers in service last year, while the Consolidated Liberator type of heavy bomber would give us an aircraft with high speed and huge bomb-load capacity. The Consolidated Company also gave us the P.B.Y. Catalina flying-boats, which with their great range formed an essential reinforcement of the Coastal Command.

The Coastal Command, whose operations have always conformed to the requirements of the Admiralty, had been strengthened and was being strengthened further. Aircraft of greater endurance and longer range were being brought into service, and the technical apparatus which enabled aeroplanes more readily to hunt the U-boat was being steadily improved.

To attack effectively we must attack from a secure base, and there were two dangers against which we were constantly strengthening our defences—the attack on our shipping and the night bomber. Neither of these tasks was easy, and called for unremitting effort on the part of scientists, designers, engineers, air staff, Command pilots and maintenance personnel. The story of the achievements of the scientists, whenever it might be possible to publish it, would be found little short of miraculous, especially in the field of radio.

Leaving out of account reserves, we had destroyed half the Italian first line, and we had certainly destroyed much more than half of the first line with which the Germans entered the war. But the Italian output was not entirely negligible, and some part of our Forces would thus continue to be engaged by the Italian Air Force. Meanwhile the German output continued at a high level and augmented the German Air Force.

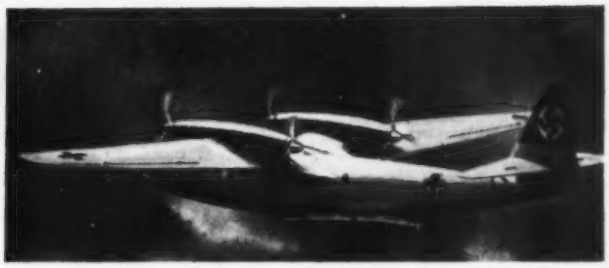
There were grounds of confidence for the future.

Eleventh of the Series

FRIEND or FOE?

Two Four-engined Flying-boats: The Sunderland and the Do 26

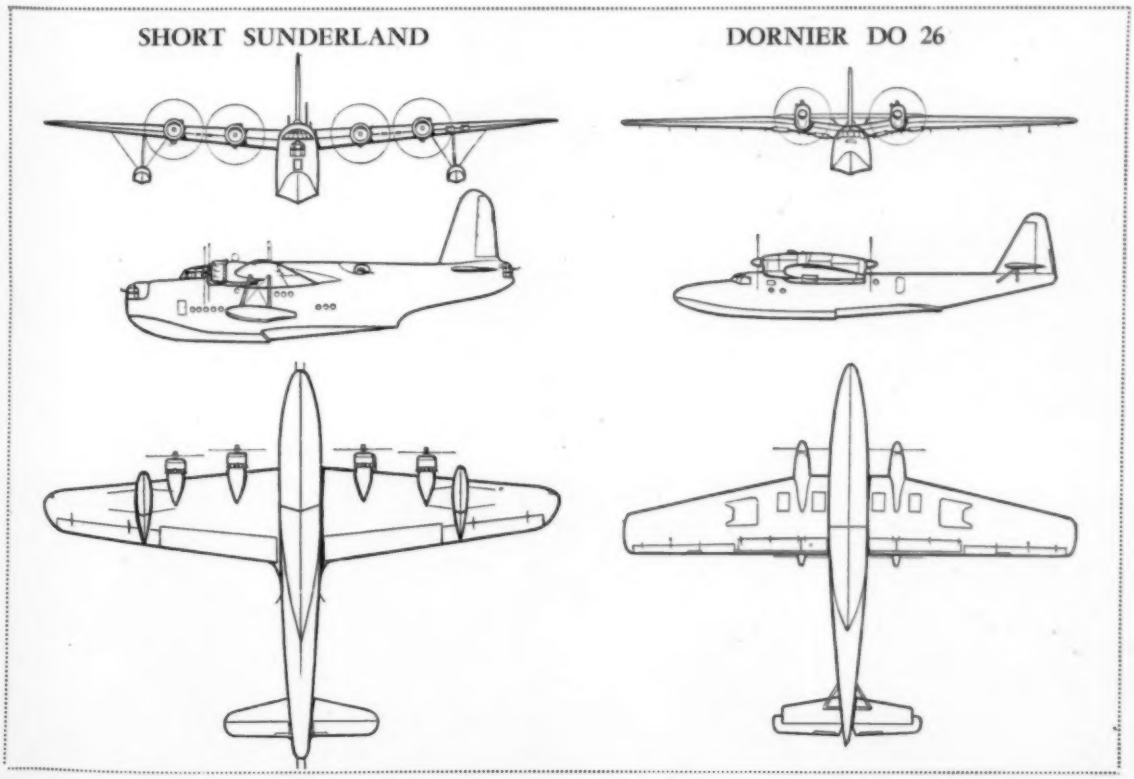
Short Sunderland. High-wing, sharply tapering to small, rounded tips; dihedral from roots. Four radial engines in short nacelles. Deep hull with gun-turrets in nose and tail and gun-position amidships. Tall, symmetrical fin and rudder and tapering cantilever tailplane.



Dornier Do 26. Gulled wings, backswept on leading edge; rather square tips, straight trailing-edge. Two pairs of in-line engines in tandem. Long, shallow hull; no information as to armament available. Triangular fin and rudder. Tailplane mounted on fin and braced by inverted-Vee struts.

ALTHOUGH as yet not the most commonly encountered of the German reconnaissance flying-boats, the Dornier Do 26 approximates fairly closely to the Short Sunderland in overall dimensions, the service model being a development of a type originally designed for trans-atlantic air-mails. Both are high-wing cantilever monoplanes, but they have two easily spotted differences which should rule out any fear of confusion. The Sunderland has its four radial engines in short nacelles along the leading-edge of its wings, whereas the in-line engines of the Do 26 are mounted in tandem pairs—two tractor, two pusher. Also the wings are gulled, the double nacelles being carried upon them at the "elbow." Seen in plan, the British flying-boat has gracefully tapering wings with small, rounded tips, but those of the Dornier are characteristically angular. The leading-edge is sharply swept back from the engine nacelles, but the trailing-edge is perfectly straight and the sharp-cornered tips have a slight radius. Fixed wing-tip floats are fitted to the Sunderland, but those of the Do 26 retract into the under-side of the wings.

Considerable contrast is offered by the respective hulls; the Sunderland is deep in comparison with its cross-section and has a gun-turret in nose and tail and another gun-position, which can be completely faired off, just behind the trailing-edge. The Dornier's hull, however, is comparatively shallow and gives the boat a very graceful side-elevation. No exact information is yet available as to its armament, though gun positions giving fore and aft defence can naturally be expected. The design of the Dornier's hull at the "stern" and its tail surfaces, however, would



FRIEND OR FOE? (Continued)

seem to preclude the provision of any "sting in the tail" equivalent to that of the Sunderland, whose rear-turret protrudes below its tall, symmetrical fin and rudder.

Tailplanes on both boats appear, in plan, similar in outline to their respective wings, but whereas that of the Sunderland is a cantilever structure mounted on the hull itself, the Dornier tailplane is set on the fin and is externally braced by inverted-Vee struts.

Types previously compared: (1) Hurricane and Me 109; (2) Spitfire and He 113; (3) Beaufort and Ju 88; (4) Lysander and Hs 126; (5) Hudson and Me 110; (6) Anson and Fw 187; (7) Hereford and Do 215; (8) Blenheim IV and Heinkel 111K; (9) Blackburn Skua and Junkers Ju 87B; (10) Fairey Swordfish and Arado Ar 95.

Next week: Gloster Gladiator and Fiat CR 42.

THE A.T.C. HAS "TAKEN OFF"

Potential Airmen in 1,000 Squadrons Get Down to Business

ALTHOUGH inaugurated only last month, the Air Training Corps has been rapidly organised throughout the whole country with some 1,000 university, college, school and local squadrons, and actual training has now begun.

Evening classes, practical and theoretical, give the boys a useful grounding, which will prove a "flying start" when they join the R.A.F. or Fleet Air Arm later on.

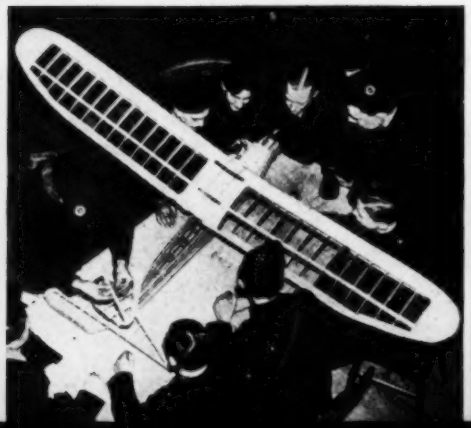
(Top) On Parade. Although formed only 14 days before, No. 227 Squadron, Dagenham, paraded before their mayor some 300 strong. Here you see them on the march, led by the smart little band of the Ilford squadron.

(Left) Friend or Foe? One of the things the cadets are taught is how to recognise different aircraft in flight, and most boys are already well versed in the characteristics of the more common types on both sides.

(Bottom, left) The Urge-box! No part of an aircraft is more interesting to the enthusiastic potential airman than the power-unit, especially if he has leanings towards the job of engine-fitter or maintenance. This group of school cadets is being initiated into the mysteries (?) of a famous brand of radial engine which, though it may not be the very latest model, demonstrates the fundamentals of the type.

(Centre) Now we're getting somewhere! But like all boys, they're eager to get to the actual aircraft, even if it's only a model in the early stages. Quite a lot can be learnt from models.

(Below) At it hammer and tongs! There's nothing like starting at the beginning, and these city messenger boys of the Cable and Wireless squadron are learning the tricks of the "smithy's" shop.



AIR-COOLED v. LIQUID-COOLED AIRCRAFT

Performance Compared in Each of the Main Groups —Fighters, Bombers and Flying Boats

By JOHN G. LEE (United Aircraft Corporation)

(Continued from page 210)

USING the data presented in the first part of this paper, certain groups of airplanes have been postulated and performance of air-cooled and liquid-cooled engines compared in each group. Certain of the engines are now in production; others are modifications of present engines; still others are only on paper.

The first group of airplanes to be considered is the pursuit type, such as that shown in Fig. 9. This somewhat unorthodox arrangement was chosen because it permits the smallest possible fuselage, considering the size requirements of the pilot and the engine; it permits the installation of cannon or other heavy armament directly in front of the pilot; it eliminates the violent torque reactions because of its opposite rotating propellers; and finally, it permits egress from the airplane with a parachute. Admittedly, this type of pursuit plane involves the weight and complication of shaft drives and gearing, and it is not particularly suited to laminar flow wings. One cannot have everything. Parallel calculations were made on a group of strictly orthodox pursuit airplanes, and on another group which were of the single propeller pusher type. The conclusions reached from the study of these other types were identical with the conclusions reached in the study of the type in Fig. 9. Hence, it is fair to say that the particular arrangement does not favor either air-cooled or liquid-cooled engines.

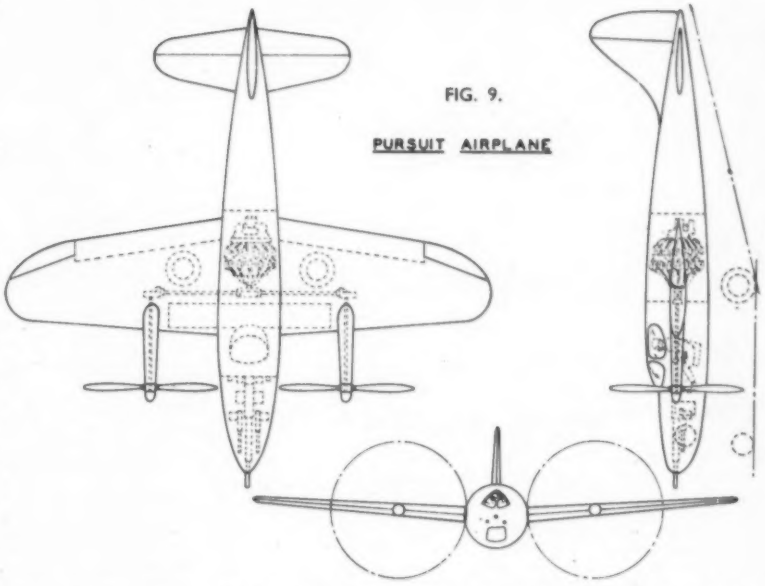


FIG. 9.

PURSUIT AIRPLANE

In Table IV are listed the weight and drag constants used in the study of not only the pursuit airplane but also of the bombing and flying-boat types which follow. Every effort has been made in the selection of these various constants to make the comparison between air-cooled and liquid-cooled strictly fair. In particular, the size of the fuselage was adjusted to the size of the engine, the wing area was adjusted to the weight, etc. The necessity for making these adjustments is paramount. The airplane must be designed to fit the engine. The procedure of putting a fat air-cooled engine in a slim liquid-cooled fuselage, or vice versa, and letting the wing-loading do what it may, gives a false comparison. Such installations may be a useful military expedient when haste is essential, but air-cooled and liquid-cooled engines cannot properly be compared on that basis. The airplane must fit the engine.

Turning now to Fig. 10, the top speed of a group of pursuit airplanes of the type shown in Fig. 9 has been plotted against the brake horsepower. The extremely high speeds shown are the result of a uniform assumption that the present take-off power rating will be available in the future at 25,000ft., that compressibility burble can be postponed, and that a 40 lb./sq. ft. wing loading can be ultimately employed. It appears that the liquid-cooled planes are roughly 10 m.p.h. faster than those fitted with air-cooled radials. Looked at another way, the air-cooled planes would require some 250 additional horsepower to attain the same high speed as the equivalent liquid-cooled planes. The really important fact is that for planes of equally clean design, much greater gains may be made by increasing the power than by changing the type of cooling. If a 2,000 h.p. air-cooled engine is available, liquid-cooled engines of 1,200 or 1,500 h.p. simply cannot compete with it.

We are accustomed to comparing airplanes on the basis of equal power and pay little attention to the fact that the liquid-cooled airplane, being heavier, is also the larger.

FIG. 10.

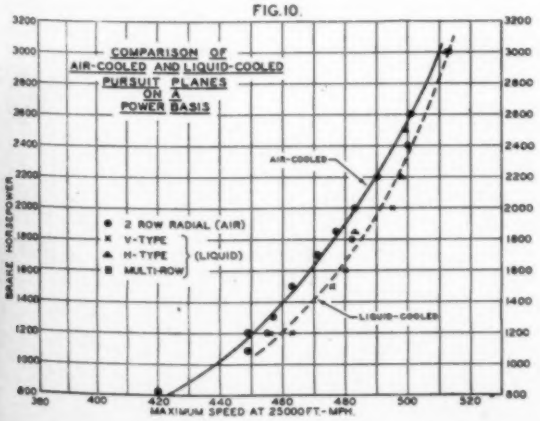


FIG. 11.

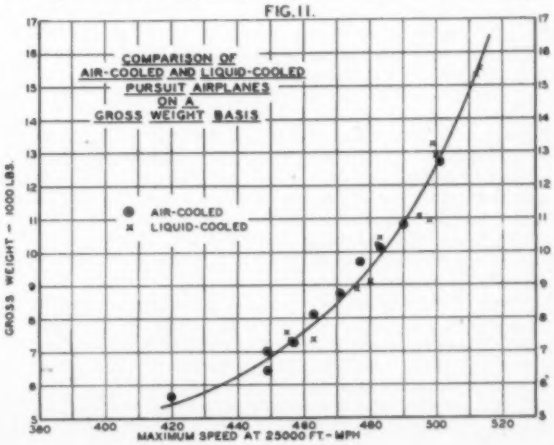
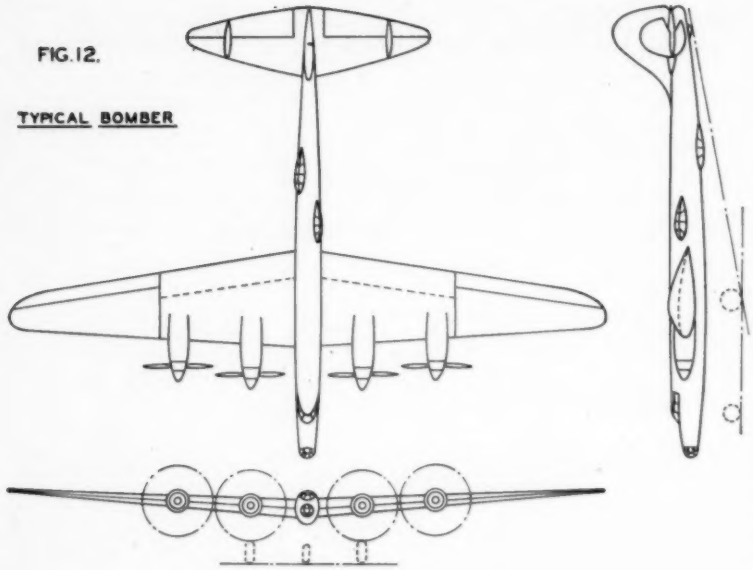

COMPARISON OF AIR-COOLED AND LIQUID-COOLED PURSUIT AIRPLANES ON A GROSS WEIGHT BASIS
AIR-COOLED
LIQUID-COOLED
GROSS WEIGHT - 1000 LBS.
MAXIMUM SPEED AT 25000 FT.-MPH

FIG. 12.

TYPICAL BOMBER



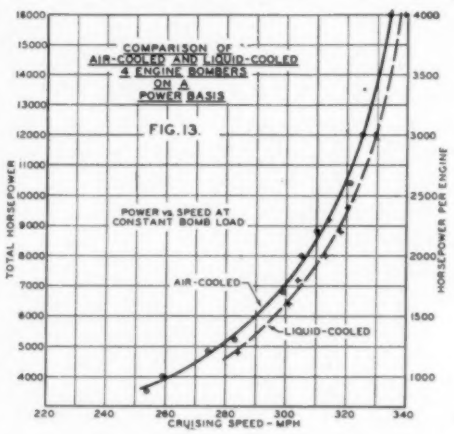
AIR-COOLED v. LIQUID-COOLED AIRCRAFT (Contd.)

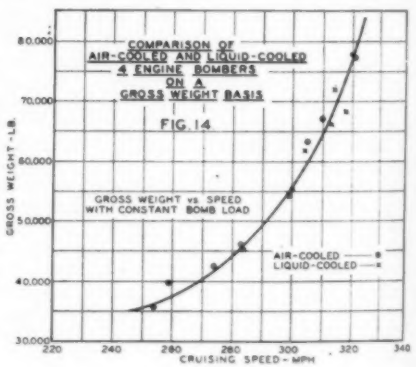
Analysis of Future Bombing Airplanes

In Fig. 12 is shown a 3-view drawing of a typical bombing airplane, of the 4-engine type. Similar studies were made of twin-engine bombers carrying a slightly reduced crew but otherwise identical. The same conclusions were reached with both types, so only the 4-engine type is discussed here. It should be noted that these bombers are of the high-speed class (350-450 m.p.h.) and carry a relatively small load (2,000 lb.) over a 3,000-mile range (in still air). Appreciably larger bomb loads could be carried with a slight increase in take-off run, which would undoubtedly be done in wartime. The size of the fuselage will accommodate bomb loads up to 10,000 lb. The performance of these bombing planes has not been projected so far into the future as the pursuit planes. The cruising speed has been taken at 15,000ft., corresponding to 50 per cent. of the rated take-off horse-power of the engines. Many of these engines are already in existence, consequently bombers of this general class could be built now.

In Fig. 13 the cruising speed of the bombers is plotted against their power. As in the case of the pursuit plane, the liquid-cooled planes have a superiority in speed at the same power

To build the larger airplane costs more money and takes more time. We are primarily concerned not with the power of the airplane but with its performance, its cost, and the difficulty of building it. We must include in that performance not only its high speed, but its climbing, landing, and maneuvering ability. To give equal maneuvering ability, that is, to be able to maneuver within the same space, requires that the air-cooled and liquid-cooled airplanes have the same wing loading. Landing requirements also demand equal wing loading. This results in the liquid-cooled being the larger and heavier airplane. When we consider airplanes on the basis of equal gross weight and wing loading, much of this difficulty disappears. The air-cooled and liquid-cooled types are then on a par not only as to construction, but also in regard to landing and manœuverability characteristics.

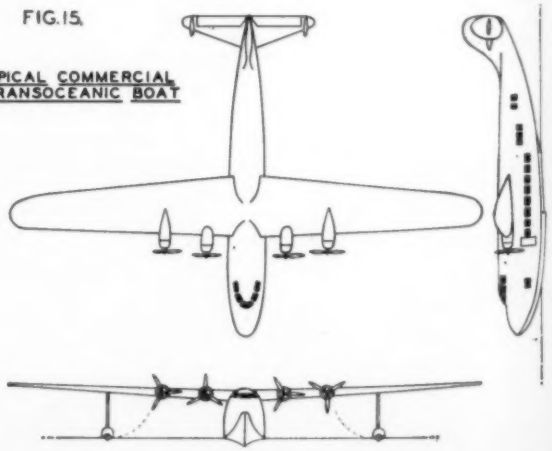

COMPARISON OF AIR-COOLED AND LIQUID-COOLED 4 ENGINE BOMBERS ON A POWER BASIS
FIG. 13.
POWER vs SPEED AT CONSTANT BOMB LOAD
AIR-COOLED
LIQUID-COOLED
TOTAL HORSE POWER
HORSE POWER PER ENGINE
CRUISING SPEED - MPH


COMPARISON OF AIR-COOLED AND LIQUID-COOLED 4 ENGINE BOMBERS ON A GROSS WEIGHT BASIS
FIG. 14
GROSS WEIGHT vs SPEED WITH CONSTANT BOMB LOAD
AIR-COOLED
LIQUID-COOLED
GROSS WEIGHT - LB
CRUISING SPEED - MPH

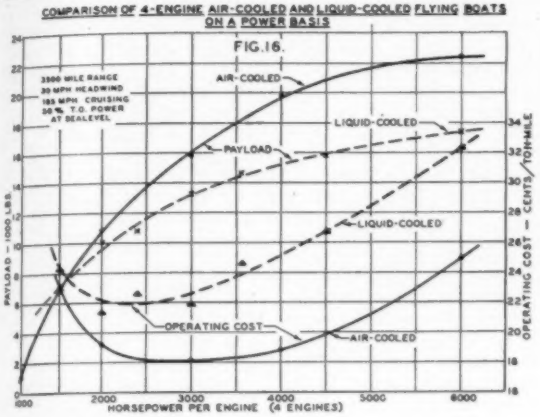
Turning now to Fig. 11, the high speed of the same group of pursuit planes has been plotted against gross weight instead of brake horse-power. It is apparent that the high speed of airplanes of equal gross weight is substantially the same. The superiority of liquid-cooled compactness has been balanced against the superiority of air-cooled lightness, and we find that for airplanes of the same gross weight and the same handling characteristics, it makes no difference which you use. The air-cooled engines merely have a slightly larger amount of power, and include the additional fuel required by that larger power. This results in a definitely lower power-loading for the air-cooled type, which means that the take-off, climb and ceiling are all definitely superior to those of the liquid-cooled type. Specifically, comparing two pursuit planes of 9,800 lb. gross weight, the air-cooled would have 2,000 h.p. and the liquid-cooled 1,750 h.p. Both would have the same top speed, but the take-off of the air-cooled would be approximately 15 per cent. shorter, the rate of climb 20 per cent. more, and the ceiling 3 per cent. higher than the liquid-cooled.

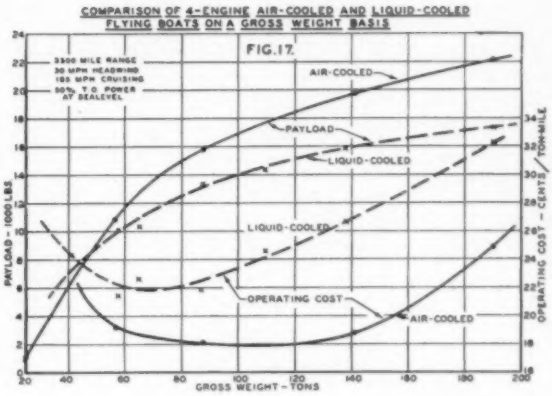
FIG. 15.

TYPICAL COMMERCIAL TRANSOCEANIC BOAT



AIR-COOLED v. LIQUID-COOLED AIRCRAFT (Continued)





amounting to approximately 6 m.p.h. at cruising or, expressed the other way, the air-cooled engines require an increase of roughly 250 h.p. per engine to give the same speed.

The same argument holds true with bombers as with pursuit airplanes, namely, that the cost of building the airplane and the size of the facilities required depend primarily upon the size and weight of the airplane, not upon its power. In Fig. 14 the performance of the same group of bombers has been plotted against gross weight. Again it is found impossible to differentiate between the air-cooled and liquid-cooled types. The same speed may be obtained with either, but, as before, the take-off climb and ceiling are all clearly in favor of the air-cooled type, with its lower power-loading. Again we must conclude that the air-cooled is superior.

Analysis of Commercial Flying Boats

In Fig. 15 is shown a typical commercial trans-oceanic flying boat of generally orthodox arrangement. These boats have been studied on the basis of a 3,500-mile cruising range against a continuous 30 m.p.h. headwind at sea level, using 50 per cent. of the engine take-off power. Calculations have been made not only of pay load, but of operating costs. In computing this operating cost, only those figures which are directly influenced by the choice of airplane equipment have been included. Items such as weather service, terminal facilities, advertising, and the like, have been omitted. However, depreciation, maintenance, repair, servicing, crew's salary and expense, etc., have been included. Extensive use has been made of the data presented by Mentzer & Nourse* in their paper before the I.A.S. last year, but with proper modification due to the use of over-water aircraft and the longer route.

There are several ways in which the comparison of commercial boats may be made. Since the bombers were compared with equal bomb loads and variable cruising speeds, it will be interesting to compare the boats with variable pay load and equal cruising speeds. Accordingly, in Fig. 16 the pay loads and operating costs of a group of flying boats cruising at 185 m.p.h. (still air) have been plotted against engine horsepower. In this case the superiority of the air-cooled engine is apparent at once. On the basis of equal horsepower, the air-cooled installation carries the greater pay load and hence has the lower operating costs, excepting in engines of the 1,000-1,500 h.p. class. In this class the air-cooled has been taken as a single-row radial, which has large frontal area per unit of power. In all other cases the air-cooled engines are of the multi-row type. It is well to recall that equal specific fuel consumptions have been figured for both air-cooled and liquid-cooled types, although the evidence indicates that better fuel consumption can be attained with the air-cooled type.

* "Some Economic Aspects of Transport Airplane Performance." *Jour. Aero Sciences*, April and May, 1940.

The same information has been replotted in Fig. 17 against gross weight. Here the same conclusions are apparent as in Fig. 16. The air-cooled is definitely superior. Although these studies have been made for commercial flying boats, it is obvious that the same results would be obtained in bombers or in patrol boats for the same long range and heavy-load requirements.

Discussion and Conclusions

We have not discussed serviceability, vulnerability, or engine cost. These are difficult qualities to handle quantitatively. A very good qualitative case can be made for the superiority of the air-cooled engine as regards serviceability and vulnerability. A bullet through the cooling fins or the baffles, for instance, will not stop an engine. There are definite records of an air-cooled engine continuing to run with a bullet hole through the cylinder and the piston, but a bullet through a water jacket brings a plane down. An air-cooled cylinder can be replaced, but a liquid-cooled engine requires a whole new cylinder block. As for cost, those figures which have come to the writer's attention indicate much higher costs for the liquid-cooled engine, as well as for installing the engine, than for the corresponding air-cooled type. Higher cost is an indication of greater difficulty in production, and this is an important military as well as commercial consideration.

In this study it has been clearly brought out that, on the basis of equal weight, equal cleanness, and equal maneuvering characteristics, the air-cooled installation can equal the speed of the liquid-cooled, and surpass it in

TABLE IV
Weight and Drag Constants used in Figs. 10 to 17

	Pursuit		Bomber		Flying Boat	
	Air	Liq.	Air	Liq.	Air	Liq.
Engine Bare Wt.—lb./h.p.[1] ...	1.35	1.26	1.32	1.24	1.26	1.10
Power Plant Inst. Wt.—lb./h.p.	.671	.946	.710	.990	.590	.880
Fuel and Oil Wt.—lb./h.p. hr. ...	.570[2]		.480[3]		.480[4]	
Fixed Weight—lb.[5]	1,440		6,550		5,780[6]	
Non-struct. Wt.—lb.	(Summation of above items)					
Struct. Wt./Non-struct. Wt.—%	36.7		52.4		76.2[7]	
Gross Weight—lb.	(Summation of struct. and non-struct. wt.)					
Wing Loading—lb./sq. ft. ...	40		40		40	
Aspect Ratio	5.50		9.50		10.0	
Total Tail Area—% Wing Area	28.0		40.0		30.0	
Fuselage or Hull Length—% Span	94.0[8]		75.0		70.0	
Wing C_D	.0062		.0063		.0060	
Tail C_D	.0062		.0060		.0053	
Fuselage or Hull C_D[9]	.0760		.1070		.1700	
Nacelle C_D[9]	.0430		.0570		.0540	

[1] Used when manufacturer's specifications were not available—based on take-off power.
[2] Based on cruising endurance of two hours.
[3] Based on 3,000-mile cruising range at 50% take-off power.
[4] Based on 3,500-mile cruising range against continuous 30 m.p.h. headwind at 50% take-off power.
[5] Includes crew with chutes, radio, instruments, cockpit accommodations, armament, food, water, etc.
[6] Based on requirements of 40 passengers.
[7] Average value—gross weight assumed and broken down into component parts.
[8] Value for twin-propeller tractor with shaft drives.
[9] Value of C_D based on frontal area.

AIR-COOLED v. LIQUID-COOLED AIRCRAFT (Continued)

take-off, climb and ceiling. When range and weight-carrying ability are the primary consideration, the air-cooled has every advantage. In view of this situation, it is only proper to ask why are not all the engines of the warring nations of the air-cooled type? The answer is not technical, it is practical. The Germans have specialised in liquid-cooled engines ever since the last war. What few air-cooled types they have built have been of American design, built under licence. Judging by the fact that the Germans continued to buy American radials for some years, it may be inferred that they never really mastered the air-cooled types. The English have built both types, as did the French. However, the application of Meredith's ducted radiators to the liquid-cooled pursuit planes in advance of the time when his principles were applied to the air-cooled pursuit, gave the liquid-cooled type a temporary speed advantage. This advantage came at the time England was going into war production, so it was natural that her pursuit planes would be built around liquid-cooled installations, while her bombers used the air-cooled.

Because the Germans and the English use liquid-cooled pursuits is not an argument that we should. They made their decision at a time when they lacked important technical knowledge which we now have. They cannot change now. We are in an extremely fortunate position to have in production 2,000 h.p. air-cooled engines—30 per cent. more powerful than anything available abroad. The foreign nations would match them if they could, but they are learning, as some Americans have already learned, that to develop a really satisfactory 2,000 h.p. liquid-cooled engine is truly a monumental task.

Of course, we must learn from the experience of other nations when that experience applies to us; but we must not copy the mistakes of other nations, nor must we accept their limitations, if they do not apply to us. When we are possessed, as we are to-day, of technical knowledge which was not available to them at the time when they "froze" their fighting types, we should not hesitate to differ with them. In the light of our present knowledge, comparison of air-cooled and liquid-cooled aircraft upon a basis of equal size, weight and type, indicates that the air-cooled aircraft are superior.

A.T.C. UNIFORMS

Different Styles Dictated by Practical Considerations

EDITORIAL comment upon the Air Council's decision to approve a uniform with collar and tie for A.T.C. cadets in university squadrons, but tunics buttoning up to the chin for those in school and local units, was made in a recent issue of *Flight*, when the opinion was expressed that this distinction might convey the mistaken impression of some difference in status between the two sections of the corps.

An explanation of the Air Council's decision on this matter, now issued by the Air Ministry, emphasises that it was based on purely practical considerations—a fact upon which *Flight* never entertained the slightest doubt, of course.

"School and local unit boys must have jackets they can slip on quickly over civilian shirts and vests when they leave the classroom or the workshop to go on A.T.C. parades," says the official statement. "On the other hand, members of university air squadrons are destined at an early date for Air Force service (many will in future be already attested), and therefore it is reasonable to issue them with uniforms they can continue to wear in the service.

"There is no element of snobbery in the regulations for uniforms," the Air Ministry adds.

"The public school boy of 16 to 18 and the boy of the same age who is employed full-time in a factory wear precisely the same uniform. So, too, the young man who has gone up to the University at his own expense will wear precisely the same uniform, an airman's uniform, as the young man who has gone up with a State scholarship or under the Air Ministry special Short Course Scheme.

"The uniform which is worn by local and school units of the A.T.C. alike is one which was taken over from the Air Defence Cadet Corps and which is eminently suitable for youths of 16 to 18. The same uniform would not be so suitable for men of 19 and 20, and members of University Air Squadrons will in consequence be wearing ordinary type uniform though with A.T.C. buttons.

"The difference of uniform between school and local units and University units corresponds to the distinction which existed and which still exists between the uniforms of the Senior Training Corps at the Universities and the Junior Training Corps at the schools."

Flight's original criticism of the distinction in uniform was inspired by the fear that it might create, in the mind of the public, the quite unfounded notion that the 'Varsity air squadrons were regarded as being of a higher status in the A.T.C. than were school and local squadrons. Our editorial laid particular stress upon the unquestioned equality of *opportunity* which the A.T.C. would provide for every cadet, and commended the essentially democratic ideal underlying the corps from its inception. In our view, therefore, complete uniformity in dress would have been preferable.

Fog Investigations

DR. SVERRE PETTERSSEN, in the fourth Wright Brothers lecture on "Recent Fog Investigations," said that the physics of fog had been investigated to a considerable extent but much remained to be done. The principal problem was still the forecasting of fog, and experience had shown that its formation depended on many local factors such as air currents and sources of pollution. The average diameter of a fog particle he gave as 40 microns (1 micron is one-millionth of a metre) and he also stated that "there is no region of the radiant energy spectrum which will penetrate fog better than visible light."

It has been found that fogs over the ocean contain magnesium and sodium chlorides, and that other fogs contain sulphates, probably from the burning of the sulphur in coal and other fuels. On the question of the artificial dissipation of fog, Dr. Petterssen said that heat did not appear to be a practical possibility, but it had been possible to make a clearing 40 by 600 metres with a depth of 10 metres by spraying saturated aqueous solution of calcium chloride into the air at the rate of 85 gals. per minute. This had been done even with a wind velocity as high as 16 m.p.h.

R. L. Ives, of the University of Colorado, is also working on the fog problem, and he considers that the presence of super-cooled fog droplets can be detected by using a source of noise and a polariscope. By this means a pilot might be notified of wing icing conditions in sufficient time to avoid them. Readers may have noticed that the coronas round the headlights of a car in fog increase in brilliance when the horn is blown.

January Exports from U.S.A.

ANOTHER report from Washington gives additional details in regard to the January production of American military aircraft. The report says that of the 419 aeroplanes which left the United States on British account, 102 came to the United Kingdom, 135 went to Canada, 120 to the Gold Coast, 43 to Malaya and 19 to South Africa.

Most of those to Canada would be trainers, but the 120 sent to the Gold Coast would almost certainly be operational types for strengthening the British forces in the Middle East. It seems a reasonable speculation that there will be a lot doing in the Balkans soon, and that aircraft will be needed to do it. For those whose geography is a bit shaky, the Gold Coast is a British possession on the lower part of the "bump" of Africa, and Takoradi is one of its ports. An airline runs from here across the continent to Khartoum.

FRIEND OR FOE AND OTHERS

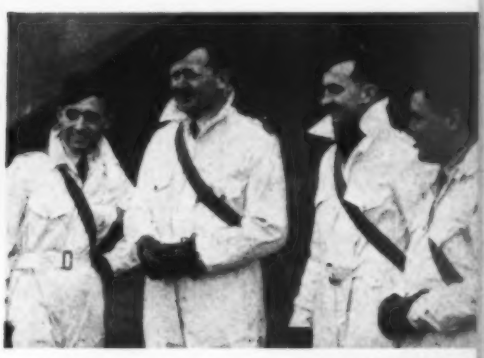
Airmen of Various Nations

(Above) A London squadron of the R.A.F.
(Left) Egyptian pupil pilots.

Turkish squadron under inspection.

Polish airmen on parade.

(Above) German Luftwaffe
(Left) Indian Air Force.
(Right) Royal Australian Air Force.



Italian airmen captured by Greeks.

(Above) South African Air Force.
(Below) Belgian pilots.

(Above) Czechs with R.A.F.
(Below) French Armée de l'air.

Air Strategy—XLV

BASES of SUPPLY and EMPLOYMENT

Britain's Air Lines of Communication are Lengthening

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C.

THE Imperial flying forces now have two major bases of aircraft supply and two minor bases. The major bases are, first, the United Kingdom, and, second, the United States of America and Canada; the minor bases are Australia and India. That means that aircraft are being made in the north and south hemispheres and, taking longitude into consideration, literally in every "quarter" of the globe.

Taking the United States alone, 2,500 miles lie between plants in the east and plants in the west; the factories in Britain are 3,000 miles from the nearest American factories; east to India is another 4,000 miles; and from India to Australia is as much again This dispersion is a valuable form of protection in war, but, unless it is organised to fit into the requirements of the units ultimately employing the equipment, it may well have disadvantages which will become more difficult to eliminate with the expansion of output.

Unquestionably, with the situation in which Britain found herself forced to declare war against Germany, the most important matter in aeronautical supply was to get delivery speeded up; where the aircraft came from was relatively unimportant provided they were up to a standard of efficiency commensurate with the requirements of the Royal Air Force.

It was the Italian declaration of war which took the war outside Europe, and that act changed the character of the conflict immediately. Since Italy entered the war the major strategy of Britain has obviously been directed towards the defeat of the Italian forces outside Italy and, if that aim is obtained in totality, the result will be the confinement of the war within the European continent once more. Hence the counter moves by Japan in the Far East in collaboration with the Axis partners in Europe; hence, too, the German move into Bulgaria, for the confinement of the war to the continent of Europe spells disaster by strangulation to Germany and Italy.

Drang Nach Aussen

Europe, as a continent dominated by Germany, can provide many of the requirements of a nation at war to-day. But it cannot provide certain requirements in sufficient quantity and others not at all. Germany must break through and get out of Europe or be defeated just as surely as she was defeated in 1918. Even the complete defeat and subjugation of the British Isles by Germany would not now give her victory, for the British Isles do not in themselves supply the deficiencies which must be the gravest source of worry to those responsible for Germany's power to continue the struggle. That struggle is now defined with the utmost clarity as a struggle to the death between the English-speaking peoples and the German-speaking peoples. On this basis the odds are against Germany. There are (not including the Irish Free State) approximately 190 millions of English-speaking people in the world against 100 millions of German-speaking people. In such a struggle it is fundamentally race which counts. Allies may be useful, but if they are of a different race, speaking a different language and thinking in a different manner, they may, in spite of the most solemn pledges, let an allied nation down. I am willing to bet that the ties which bind Germany and Japan are looked upon from either end through vastly different spectacles. So, too, with Germany and Italy, closer though these two are in geographical relationship. British propagandists should direct their efforts towards the magnification of the differences which form the race cleavage lines between our enemies.

Now, as this is fundamentally a race war between the German- and English-speaking peoples, it can be won only by the overthrow of one of these race groups; with or without the assistance of allies on one side or the other. Hitler's policy of collecting all his Volk in one Reich gave him great initial strength at the beginning of the war, just as it gave him great war manufacturing capacity prior to the war. But now that policy of his is recoiling upon the heads of the people he has led, for in this modern war of machine versus machine his concentrated millions are herded together on the continent of Europe while the range of the aeroplane is growing so rapidly that there will be no security for any of them before this year is out. On the other hand, the English-speaking peoples dispersed far and wide across the earth's surface can be attacked only piecemeal and many cannot be attacked by Germany at all, but only by means of an ally, Japan, whose rise to still greater power as a result of the necessity of Germany (and the concentration of Britain in European matters) would, of itself, constitute a negation of the Hitlerian theories of Herrenvolk—which just proves that even the most ardent theorist, like Hitler, cannot have it all ways in this so-called best of all possible worlds

Key Points

Having had regard to the bases of supply production for the British forces in this conflict, it is necessary to have regard to the major bases of employment of those supplies. The bases of employment (unlike the bases of production) have altered from time to time. Initially there were but two bases of active employment—France and Britain; at that time there was a static base of employment in the Middle East. With the collapse of France the bases of employment became Britain and the Middle East. More recently Singapore has taken the place which the Middle East occupied during the first phase of the war.

Thus it is obvious that the trend of the conflict is towards the East. This does not mean that Britain is not a bulwark which may be subjected to heavy attack, but the time has passed when the fall of Britain could spell victory for Germany, and Hitler must know that, as also must his competent generals. Their outlook upon the war must have taken on a much longer aspect than it formerly envisaged. And to succeed it now appears to be imperative for Germany to secure the active participation of Japan. Both require access to oil if their war plans are to be furthered. That must lead Germany still farther to the south and east and Japan to the south and west. There are thus four key points in Britain's chain of defence. These are the British Isles, the Middle East, Singapore and Australia. India lies centrally between the inner two, a vast reservoir of strength if it can be rightly employed. Indeed, the importance of India as a centre of production supply is hard to overstress in the strategic layout of the implications of conflict which face the English-speaking peoples at this juncture in their history.

Apart from its strategic situation as a central area wherein war manufactures would be well situated for supply to either the Middle East or Malaya, India is a remarkably useful central area for aircraft storage, for long-range aircraft can easily fly from India to Egypt non-stop and from India to Singapore non-stop.

We already have the advantage of aircraft delivery across the Atlantic. This ought to be augmented by aircraft delivery across the Pacific. Long-range bombers built in America (and flying-boats) could be delivered by the trans-Pacific route to Australia and to Singapore. India could be made a great aircraft depot from which the requirements of any of the focal points of the British conflict zones in long-range aircraft could be quickly met. The trans-atlantic and trans-Pacific aircraft delivery routes would thus feed both ends of a long line of dispersed strong points

BASES OF SUPPLY AND EMPLOYMENT (Continued)

cutting across the Old World from the Atlantic to the Pacific at 2,000-mile intervals.

It would then become possible to strengthen any one of those strong points with aircraft within 24 hours, and thus maintain aircraft strength in heavy bombers or flying-boats in spite of losses caused by casualties or by accident. But far more than that could be done. The final part of the Empire Training Scheme could be planned to embrace training in India in complete units of long-range aircraft which could leave India as units ready to go into action at focal points either to the east or west. Such units would be highly mobile. They would be like the cavalry of olden days; held in reserve but ready to charge forth at the moment of call and race forward to apply the extra stroke where it was required to halt or to rout the enemy.

Parochial Outlook

It seems to me that hitherto we have been too inclined to take a parochial view of this war. Certainly we have understood (after a time) many of its implications, but, on the whole, we have executed our plans on the same kind of basis as our plans were laid and executed in 1914-1918. There is greater mobility in areas, but there still seems to be an absence of world-wide strategic planning and execution. There was little evidence of concerted action between the Commands in the United Kingdom and the Middle East Command during the offensive in the Western Desert, nor was there a direct link-up of the units operating from Greek aerodromes. (Here I am referring to air action solely, for the Air Arm is the one arm of the Services which was capable of co-operation with the forces in the Western Desert while based on United Kingdom bases.)

Now communications for the passage of troops and the heavy and complicated mechanised equipment of a modern army between Germany and Italy are not good and they are few. Surely efforts could have been made from British air bases to cut those lines of communication where they enter Italy through the mountain passes and where the railway lines and roads are often vulnerable. There was a lamentable failure to attack Italian ports on any scale that mattered while the Western Desert offensive was being fought.

What is the reason for this evident lack of co-ordinated effort to win the war in the shortest possible time?

There can be only two answers as far as I can see. Either the bombers based in the United Kingdom were deflected to other duties (for example, anti-submarine activity, which means that we were short of long-range bombers) or there was no direct co-ordinating link between the Middle East and the Home Commands, with the result that each functioned as a separate entity as though the other simply did not exist. Either explanation betrays a weakness in our fundamental air strategy. With the chain of air areas at Britain's disposal throughout the Old World, and the air communication lines across the Atlantic and Pacific Oceans, it ought to be clear that part of the British air power must be organised as a world fleet and not upon any regional basis at all. But we have been so long cradled in the ideas of localised army garrisons and regional sea fleets that it is difficult to tear ourselves away from these relatively parochial views of the application of power in war to visualise a new form of the application of power which has for its operational zone any part of the earth's surface and whose units are spread across 10,000 miles of the earth's surface at 2,000 miles intervals from the United Kingdom to Melbourne, Australia.

The reader may say we already have aircraft so stationed. It is true. But they are all under separate commands. They are not ready to operate with any prearranged synchronisation. The reader may say that the Cabinet acts as the co-ordinator of strategy. Yes, but the Cabinet receives advice from many different commanders in the various theatres of war. And even if the Cabinet were to decide upon a major air policy to-morrow, to set that policy in motion would require the passing of instructions to many different destinations each of which would doubtless colour those instructions in the light of local circumstances.

A Long-range Command

What is really wanted is a segregation of the long-distance aircraft from the short-distance types. The latter are the kind for localised defence, for Army co-operation (in all its forms), for aircraft carriers. The long-distance aircraft are capable of being employed in a world-wide strategy of air war, are capable of being dispersed or concentrated to meet changing conditions, of bringing every corner of Germany and German-occupied territory under fire, of drawing a chain of defence across half the world which can be fed at either end from the plants in America and at the Western end from those in the United Kingdom as well. The air lines of communication of the British air forces are lengthening. The creation of a separate Air Command of this kind would correlate those lengthening air lines and at the decisive moment its dispositions would have been so made that the effective link in the chain would be short. And, above all, mobility, the most precious asset in air power, would be utilised instead of, as in the past, being ignored as of little worth.

A.T.A. Asks for Pilots

THE Air Transport Auxiliary requires more pilots and is prepared to give consideration to applications received from members of the Civil Air Guard who have solo flying experience, are not required for flying duties with the Royal Air Force, and are free to serve A.T.A. or are engaged on work of lesser importance. No minimum number of solo flying hours has been laid down as an entrance qualification, and pilots will be accepted for training in order of ability.

They must be between the ages of 28 and 50 and are required to pass a medical examination of approximately "A" licence standard. The work for which they are required is the ferrying of military aircraft or general communication work. Training in the flying of types which they will handle is given at an instructional school, after which pilots are on probation in a training pool before posting to duty.

Rank	Basic Pay £	Flying Pay £	Total per annum £
Cadet (on probation)	285	—	285
2nd Officer	285	120	405
1st Officer (C)	350	120	470
1st Officer (B)	350	180	530
Captain (add £60 command pay)	350	180	590

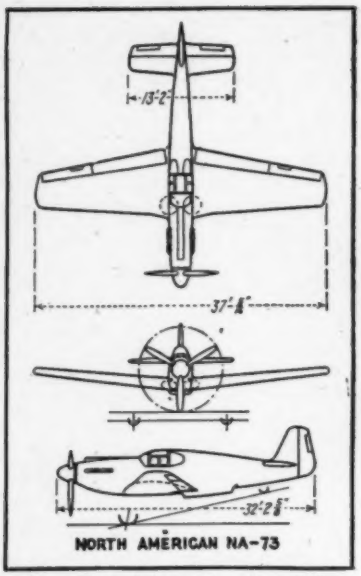
The table gives rates of pay, to which a subsistence allowance of £15 per month (£7 10s. when on probation) is added. Travelling expenses when away from base on duty are also paid. Free medical attention as may be required by duty is provided, and medical expenses consequent upon injury or illness from the performance of duty are also reimbursed so long as employment continues. Insurance is operative from commencement of flying training, the benefits being £2,000 for death, blindness, or loss of two limbs, and smaller sums for other injuries. Those interested should obtain the general conditions and an application form from the Ministry of Aircraft Production, Room 101, London.

Hydraulic Equipment

WE have received from Dowty Equipment, Ltd., of Arle Court, Cheltenham, a copy of their book "Aircraft Hydraulic Equipment," by R. H. Bound; A.F.R.Ae.S., A.M.I.A.E., who is technical director of the firm. This book of 99 pages, lavishly illustrated with 80 drawings and half-tones showing the operation of various components, devotes a chapter to each of the types of hydraulic equipment. Typical chapter headings are: Pumps, Control Valves, Jacks, Filters, Ground Test Couplings, Feathering Airscrew Controls, Retracting Undercarriages and Testing. The text is devoted chiefly to an explanation of how each unit or installation works. The book will be of great value to anyone whose work is concerned with the design of hydraulic systems or their installation. It is not intended as a maintenance manual.

NEWS from THE STATES

Some Interesting Items of Design, Output and Performance



Plan, side and front elevation of the North American Mustang fighter (Allison).

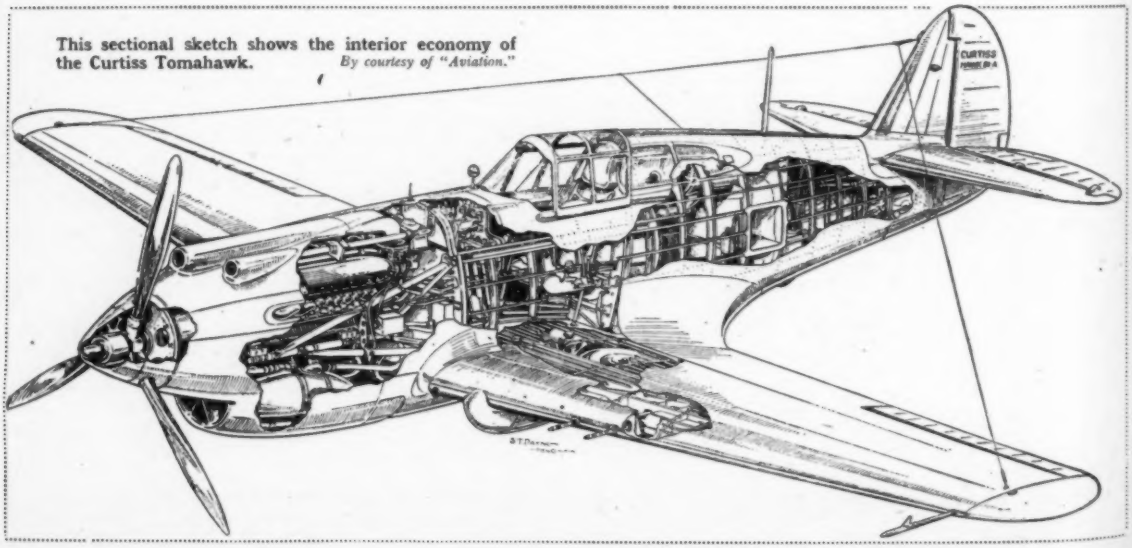
AIR CHIEF MARSHAL SIR HUGH DOWDING, A.O.C. - in - C. Fighter Command during last autumn's blitz, is in the States on a special mission for the Ministry of Aircraft Production. The newspaper reporters have learned of his nickname "Stuffy" and are working it to death. He told them that the Martin Maryland was in use in the Middle East—which was not news—but went on to say that the Curtiss Tomahawks were doing well after modification. The Douglas Boston, he said, was to perform a dual rôle—presumably high-speed attack-bomber and night fighter—and he also stated that bombers such as Lockheeds and Liberators were flying the Atlantic all the time. Answering a question, he said that no inferior petrol had been found in the tanks of captured German aircraft, but some strange stuff had been found in German transport tanks.

Northrops are turning out one a week of these N3 P.B. bombers for the Norwegian Air Force in England. The engine is a Wright Cyclone of 1,200 h.p. and the speed 235 m.p.h. A bomb load of 2,000 lb. can be carried. Gross weight is 8,500 lb.

The general arrangement drawings of the North-American Mustang (1,100 h.p. Allison) shown at the top of the page, give this machine the appearance of being a very eyeable job. The radiator so far aft implies a considerable amount of plumbing and the cooling system is one of the most vulnerable parts of a liquid-cooled engine. Reverting for a moment to the Martin Maryland. Those which have been delivered are the ones originally ordered by the French, and it is interesting to learn that Martins propose restarting a 100-a-month assembly line on a modified type for the R.A.F. The works designation of this will be Martin 167.B4. For the U.S. Army Air Corps the Martin B.26 medium bomber (two Pratt and Whitney 1,850 h.p. Double Wasps) has gone into mass production off the drawing-board without waiting for the prototype to finish its trials. This machine has been nicknamed the flying torpedo. It weighs some 26,625 lb. all up and has a tricycle undercarriage. It has been stated that this is very similar to the model which is in production for the R.A.F., and it can therefore be considered as identical with the Baltimore. (Some notes on this machine appeared in our issue of January 23, 1940.) Other news from the assembly lines is that Lockheeds are turning out four Hudsons a day for the Coastal Command and Northrops one a week of the N3 PB. floatplanes. Information from one source credits the Grumman Martlet as now produced for the R.A.F. with a considerably increased performance. Top speed is now stepped up to 350 m.p.h. and the service ceiling from 28,000ft. to 37,000ft.

The sectional drawing below shows, among other features, how the 0.5in. machine guns lie along the cylinder banks of the Allison engine and also how the ends of the instrument panel have been shaped to enable the pilot to get at the cocking handles.

This sectional sketch shows the interior economy of the Curtiss Tomahawk. *By courtesy of "Aviation."*



THE SLIP-WING BOMBER

A Reply to Numerous Correspondents

By NOEL PEMBERTON-BILLING

IT is now more than three months since, through the courtesy of the columns of *Flight*, I first published the principles of the slip-wing scheme for attaining high wing-loading without increasing the length or the speed of the take-off run. There can be no doubt of the interest that it has aroused, both inside and outside the Air Service and the industry. Ample evidence of this is shown by the numerous letters on the subject which have been addressed both to the Editor and to myself.

Only a small selection of these could be published in the columns of *Flight*, but I think that most of the more useful criticisms and suggestions have been printed, and it may be of interest if these contributions are reviewed in the light of my original statements.

Fighter v. Bomber

One of the most provocative statements in my original article concerned the relationship between the fighter and the bomber, and my claim that, by using the slip-wing to assist take-off with high wing loading, it would always be possible to build a bomber faster than any fighter. The exceptional interest which this argument aroused led me to write a further article amplifying the subject. This was published in *Flight* of December 19th, 1940. There I showed that if the fighter was built to be manœuvrable it would need more wing area, whilst if it depended on movable turret-guns this would affect the speed to an even greater degree.

Thus, although no fighter built on orthodox principles can approach the slip-wing bomber in speed, there is one possible development which may enable a fighter to reach a similar speed, and that is the provision of fixed guns firing not only forward but also backwards and sideways, with mirror sights, so that the pilot can alter his course slightly and bring the opposing aeroplane into the sight of whichever gun is most suitable.

One of the first problems to be solved, already mentioned by the Editor in one of his leading articles, is the effect of recoil in firing a broadside from a small aeroplane. The only way in which this can be overcome is by a modification of the principle of the Davis gun, used in the last war, which fires a blank cartridge in the opposite direction to the shell, thus balancing the recoil. A shell-firing gun on this principle was mounted in a "turret" on the top of the big Supermarine Nighthawk twin-engined fighter which I built in 1916 to combat the Zeppelins.

In the case of the single-seater fighter there would be no need to fire a blank cartridge in one direction; the gun could be built across the fuselage so that it fired out of both sides. This has the disadvantage that so many shells or bullets are wasted, but the number of opportunities for firing that are likely to occur with the high-speed aeroplanes of the future is so small that the question of ammunition weight is not likely to be so critical.

In addition to firing broadsides, this type of fighter would have a gun in the tail to fire backwards, a feature that is reported to be installed on some Ju. 88 bombers. A somewhat similar gun mounted externally below the nose, with a limited range of movement, has long been a feature of the Mark IV Blenheim. Some years ago an experimental British fighter* was fitted with a fixed gun firing upwards above the airscrew arc at about 45 deg. for attacking bombers from underneath, an arrangement that was also used on some of the fighters of the last war, prior to the introduction of the interrupted gear. A gun of this type would be of value on the fighter of the future, for there may be many occasions when the fighter is, to use yachting parlance, behind and to leeward of the bomber, and its superiority in performance, if any, so small that it has little chance of simultaneously climbing above and overtaking the raider.

* [The Westland "cow-gun" fighter.—*Ed.*]

Presuming that, by the adoption of this form of armament, a fighter can be built as fast as, and possibly slightly faster than, the high-speed bomber, I still cannot believe that the bomber is seriously menaced, for its inferiority in speed will always be so small that the fighter will have to be very near before it has much chance of making contact. There will be no question, as at present, of taking off from the ground and climbing after the bomber. Also, there is no reason why, at a slight cost in performance, the bomber should not be fitted with similar armament, thus putting it very nearly on equal terms with the fighter. And every time the fighter fires its guns it will lose 20-50 m.p.h., which probably means it will not have the opportunity for more than one burst.

The High-flying Bomber

In an article in *Flight* of December 12th, 1940, I dealt with some of the possibilities of attack from the sub-stratosphere, a danger which I still believe to be very real. Fortunately, there are indications that the authorities are taking some action in this respect, although hardly on the unconventional lines that such an unconventional form of attack requires.

I would, therefore, like to repeat my belief that pressure suits rather than pressure cabins must be developed for military purposes. The cabin promises greater comfort and more efficient flying and navigating, but it is hopelessly vulnerable to attack from fighters. The suggestion that the crew should put patches over bullet-holes cannot be considered seriously when fighters are being fitted with as many as twelve guns, pouring out bullets at the rate of thousands per minute. The value of a self-sealing cabin built like a bullet-proof fuel tank would be small, for even if the weight were not prohibitive, it would not offer protection against the shell-firing guns that are now being fitted almost universally to fighting aircraft.

The Slip-wing Principle

Criticisms concerning the slip-wing bomber can be conveniently sub-divided into those which refer to the principle and those, less important, concerning the design of the particular example which I used to illustrate the possibilities of the method.

Of the slip-wing principle itself there has been very little criticism, as indeed one would expect, for the idea is so simple and so obviously practical that I do not think there can be any difficulties other than those which I outlined, together with their solutions, in the original article.

The effect of the acceleration on the pilots at the moment of separation is often brought up, despite my original remarks on the subject. In this connection, critics often fall into the error of saying that both pilots will receive an acceleration of say, 4 g, when it should be obvious that it is only the pilot of the upper component who can suffer in this respect.

It is not difficult to arrange (in fact, I have done so) for the incidence of the upper component relative to the lower to be reduced immediately before separation to reduce the effect on the glider pilot.

I do not think any other criticism of the slip-wing principle has been offered. One somewhat uncharitable contributor introduced various minor innuendos concerning the design of the lower component, and also complained that I had made "no mention of a convenient way of hoisting the 1,000 sq. ft. 'glider' into position above the bomber." This naturally requires the services of a small mobile crane, not a very serious addition to the equipment of an aerodrome.

The particular aeroplane illustrated was somewhat of a "freak" in that it was designed to fulfil an arbitrary

THE SLIP-WING BOMBER (Continued)

specification laid down by Capt. Macmillan for 5,000 miles, five tons, 400 m.p h., a range which would not be required for the job of bombing Germany, which is the only job that matters in this particular war.

For the latter purpose I am in favour of a much smaller type of bomber, and the slip-wing scheme is, I feel, most suitable for the development of a small high-speed bomber with about 250 sq. ft. of wing, and thus requiring a slip-wing with about 300 sq. ft. of wing, and weighing about 1,400 lb., which is, of course, an easy proposition to hoist into position.

The post-war development of commercial flying will equally require high wing loadings to make possible economical large aeroplanes. In such cases, when the proportions of both components become very great, it will be necessary to provide take-off bases with a gallows or ramp so that the slip-wing can be wheeled into position. But in the case of the small slip-wings I recommend for war purposes, they could be man-handled if necessary.

The P.B. 49

In view of the fact that it was little more than a "sketch design," detail criticisms of the particular lower component illustrated are worth considering only in so far as they may apply to the small high-speed bomber in general.

An early contributor raised the question of the proportion of the undercarriage weight to the gross weight at take off, but this has already been answered by a later letter from a more thoughtful reader, pointing out that, as the loads encountered in take-off should not be as great as those incurred in landing, it is permissible to use reduced factors for take-off where a large "droppable" or "burnable" load is carried. That this is officially recognised and approved is illustrated by the use of overload take-offs with existing bombers, in which case the undercarriage weight automatically becomes a smaller proportion of the new gross weight. In the particular case of the P.B.49, the undercarriage weight is 4.2 per cent. of the combined weight at take-off, and more than 12 per cent. of the landing weight, compared with 6.5 per cent. of the landing weight for the D.C.4, which, being a very large machine, is not in any case a fair comparison.

The Need for Assisted Take-off

To those who doubt the value of the slip-wing scheme, I do not think any argument could be more convincing than to compare the figures for P.B.49 with those sent in by Mr. John W. Morrison in *Flight* of December 5th, 1940, for a bomber to achieve a similar performance without assisted take-off.

The slip-wing bomber has 400 sq. ft. of wing, and a gross weight of 41,460 lb. It requires about 1,900 gallons of fuel for 5,000 miles, and has altogether 4,000 h.p. The "Bomber A" suggested by Mr. Morrison has 3,900 sq. ft. of wing, and weighs 190 400 lb., or 85 tons, and requires 20,000 h.p. and 52,500 lb. of fuel.

Even these figures are attained only by assuming for "Bomber A" a fuel consumption far below the best at present achieved, and an overall L/D of 24, which presupposes a miraculously streamlined design. On a basis of first cost and production time, the slip-wing is £200,000, or eight times cheaper, and on operating costs it is about £4,500 cheaper per flight, or twelve times, on fuel alone, without consideration of the oil at about 7s. 6d. per gallon, or the crew of ten as compared with three. The unassisted take-off aeroplane would charge altogether, taking 5 per cent. as the War Risk Insurance, about £20,000 to deliver its five tons of bombs, compared with about £1,000 for the slip-wing bomber; and, although there are no bombers so large at present in service, the relative advantage of the slip-wing is approximately the same in all classes.

The Buried Engine

There is insufficient space in this article to consider in any detail the numerous problems associated with the buried engine and remote drive, but this is a question which I have dealt with very fully in the book, *The Aeroplane of To-morrow*, mentioned above. There cannot be any argument about whether the submerged engine is 'desirable" or not, because one just cannot attain very high speeds without it. The critical speed for a radial engine nacelle at sea level is about 400 miles per hour, compared with over 600 for an elliptically nosed fuselage, and tractor airscrews cannot be used at more than about 500 miles per hour.

But even for slower aeroplanes the buried engine is an inevitable development. The disadvantages of outboard engine nacelles are legion. The principal among them can be mentioned :—

(1) Effect on airscrew of large obstruction immediately behind it.

(2) Slipstream drag.

(3) Drag of nacelles is usually high because their bluff shape necessitated by the short wing chord causes immediate separation of flow and turbulence.

(4) Turbulent boundary layer round nacelle causes early transition point on wing, and thus increases the drag over a considerable portion of the span.

(5) Elliptical lift distribution is upset, causing an increase in induced drag.

(6) For similar reasons, nacelles cause premature stalling of wing.

(7) Large outboard weights have a bad effect on stability and control.

(8) Gyroscopic loads due to both airscrews rotating in same direction.

(9) In single-geared flight, thrust from one engine and airscrew drag from the other cause large yawing couple. Feathering airscrews alleviate, but do not eliminate, this trouble.

(10) Nacelles upset flow over tail and cause large pitching moments.

(11) Considerable portion of wing area is lost.

(12) Large interference drag between nacelle and wing.

(13) Bad weight distribution may hinder, or even prevent, recovering from a spin.

These effects are relative but real. Increased wing loading reduces the size of the wing relative to the nacelle, and thus greatly accentuates these bad features, so that the buried engine is an essential accompaniment to high-wing loading.

To weigh against these disadvantages one can say in favour of outboard nacelles that they can be used to "mass balance" the wing where the flutter criterion is high, and provide "convenient receptacles" for the undercarriage, which is rather like trying to get a murderer acquitted on the ground that he killed his victim in the most economical manner that he could.

The Slip-wing Fighter

One correspondent has ventured some criticisms of the slip-wing fighter which rather suggest that he did not read the whole of the original article. In that I amplified the two points which are raised—that of the effect of the weight of the upper component on the undercarriage of the fighter, and that of the position of the centre of gravity as a composite.

I showed that the weight of the slip-wing did not reduce the factors on the fighter undercarriage below those normally permissible for overload take-offs, and, in view of the fact that the loads on landing, when the two components are separate, are greater than at take-off, this is not dangerous.

The relatively low weight of the slip-wing makes the centre of gravity, as a composite biplane, low, and the mean thrust is also low. An engine of 150 h.p. was suggested for the upper component, not 500 h.p., as quoted by a later contributor.

This correspondent, and, indeed, other people to whom I have mentioned it, are enthusiastic about the idea, also contained in the article, of dropping flares to light up the enemy raiders, whether or not the slip-wing is adopted.

STARTING EARLY: Here is a demonstration of keenness by one of *Flight* junior artists, Arthur Bowbeer. In his spare time, for years past, he has built up these scale models of aircraft, some of the types going back to early days. No youth desiring to familiarise himself with the detail and characteristics of aircraft could adopt a more instructive hobby than model aircraft manufacture.

Canadian-trained Airmen

CANADIAN air training schools will, it is reported, be turning out graduates at the rate of 2,000 a month by the end of the present year.

Cool Customers!

YOUNG Dominion airmen in the Empire Air-training Scheme are known to be cool customers, but the boys of Alberta must be the coolest of the lot to judge by a notice issued to all officers at a certain station in this Canadian province. The notice reads: "In future the morning parade will be at 0800 hours (8 a.m. in common parlance). The officer in charge will carry out drill or a route march excepting when the temperature is below minus 50 deg. F."

Whether de-icing equipment is provided for the leading-edge of their noses is not stated!

Parachute Testing

AN American firm of parachute manufacturers have an ingenious device for testing their products which is described in a recent issue of *Aviation*. It is a 50ft. tower, on top of which is a 100ft. boom capable of being rotated at a tip speed varying from 70 to 300 m.p.h.

A dummy, wearing the harness and pack, is attached by flexible streamlined rods to the tip of the boom, and, as the revs increase, is swung up from the ground until, at high speed, "he" travels in the same horizontal plane as the boom. A light cable attached to the ripcord enables the operator to release the 'chute at any desired speed and position, a suitably mounted camera filming the opening process in slow motion. Valuable data have been obtained from this testing device, but the suggestion that it might also be used for the examination of pilots under high "G" conditions sounds a trifle grim!

Keep the Air Lines Running

THE future of British commercial aviation is exercising the minds of our more far-seeing M.P.s and questions on the maintaining of certain lines (notably across the North Atlantic) which can be of service in war have recently been asked in the House.

Replying to one Member's query about the availability of sufficient experienced navigators, Sir Archibald Sinclair, Secretary for Air, said that it was intended to keep existing services running and that the greatest possible use would be made of skilled aviators available in ferrying aircraft from America. The present intention was to resume regular air transport across the North Atlantic this summer, to be operated by the British Overseas Airways Corporation.

When the larger bombers are flown across they will, no doubt, be able to carry a certain amount of freight, and the ferry service will itself be able to function to some extent as a supply line.

PLEASE SHARE YOUR COPY OF *FLIGHT!*

READERS will forgive our repeated requests that they should share copies of *Flight* and so enable us to effect a drastic reduction in paper consumption, but the matter becomes more vital every week.

If you have a friend who is also a regular reader make a point, this very week-end, of arranging to buy only one copy to share between you and then place a definite order for that copy with your newsagent to guard against possible disappointment.

HERE AND THERE

Some of the most experienced commercial pilots have already been earmarked for this important service.

Schoolgirls' A.T.C.?

IN response to enquiries it was recently intimated by the Air Ministry that there is not, at present, any official scheme, nor have they approved any organisation, under which girls younger than 18 can receive training with a view to their joining the Women's Auxiliary Air Force on reaching the age for enrolment.

Motor Industry Fighter Fund

£100,000 is the sum aimed at by the recently launched Motor Industry Fighter Fund, the object of which is to provide a complete squadron of fighters for the R.A.F. Mr. W. E. Rootes is the president of the fund, the address of which is 58, Gordon Square, London, W.C.1, and Viscount Nuffield, Lord Austin, Lord Perry and Lord Kenilworth are patrons.

An appeal is made to everyone connected with motoring—the maker, the trader, and the user—and some £50,000 has already been received, including eight donations of £5,000 or more from various firms and individuals.

Pyrotechnic Propulsion

WITH the object of increasing their bomb loads the Germans are reported to be experimenting with various forms of assisted take-off, including the use of rockets, or, to be more precise, jet-propulsion. Simultaneously, news from America of parallel experiments has just been released by the Daniel Guggenheim School of Aeronautics in New York. Some years ago, it may be remembered that experiments were made in Germany, America and elsewhere with solid fuel rockets as an alternative to the I.C. engine on cars and aircraft, but the problems of obtaining sustained power-output and of controlling it remained unsolved; many of the models, in fact, promptly blew up!

Jet-propulsion by liquid-fuel "rockets," however, holds out definite promise, especially in the form of a brief burst of extra power to assist take-off, and the fact that the Germans were experimenting along these lines has been known to *Flight* for some time, though it has only just been released for publication. *American Aviation* now reports a device under development by E. B. Myers and Dr. A. Klemin which consists of several cylinders 4ft. long and 6in. in diameter. Fuel is released into an asbestos-coated auxiliary chamber and heated until it becomes gaseous. It is then fired by a suitable ignition system and the expanding gases, issuing through a nozzle on the rear end of the chamber, develop a forward reaction. After thus assisting the take-off the device is dropped by parachute.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

CARBURETTOR DESIGN

The Case Against the Designer

IN your recently published article called "The Case for the Carburettor," the author makes the following statement: "Cutting-out troubles during aerobatics could be overcome by careful design of the carburettor."

This remark is so true that perhaps the writer of the article would like further to enlighten us as to the reason why such a design has not yet been incorporated in our fighters. For the last ten years our fastest single-seaters have been pathetically subject to engine cutting-out during negative acceleration. The word "pathetic" is used advisedly as it is a sorry sight to see the awkward manœuvres, followed by trails of black smoke in the air, forced on the pilots of our modern single-seaters when suddenly entering a dive from level flight.

Many Germans have escaped with their lives from air combat because of this very defect, yet we have it on good authority that careful design would eradicate it.

Can any of your readers justify this state of affairs.

F. H. DIXON.

The Case for the Merlin X

"THE Case for the Carburettor" article should have been headed "The Case for the Merlin X," since it seeks to prove that this excellent engine has a better performance than that of the Junkers Jumo 211 (and quite right too!). But does the Merlin necessarily owe that superiority to the carburettor? I can think of many more relevant reasons. Because of these many differences in the design of the two engines, I submit the case for the carburettor is not proved. In any case, comparative results are required above, say, 30,000 feet, and not only at sea level. To obtain a fair and convincing comparison between the carburettor and petrol injection systems, the same basic engine design should be used, modified only to give each system the best possible chance. Even then, the comparison should be made by flight trials at all altitudes, and not deduced from bench tests (with their attendant debatable "corrections"). The power output and fuel consumption figures, of course, would have to be obtained with the assistance of a torque meter or the equivalent.

The complexity of the P.I. system must be admitted, but surely it depends on what you get in return for the extra money or man-hours involved? UNCONVINCED.

THE OBSERVER CORPS

Hours of Unrecognised Work

MIGHT I answer your correspondent with reference to observers being overpaid. I should like to draw his attention to the following facts, which I feel sure will apply to the majority of O.C. posts. I myself have been in the O.C. six years last February, and we were then under the police. Our P.C. came round for six volunteers to form a crew with H.O. making seven. He was only able to get four volunteers, myself being one, and it was then understood that the work was on a purely voluntary basis; the trouble then was, there was no pay.

There are thousands of observers to-day who took on the job then and we were putting in hours of work when people did not even know we existed. We did the job cheerfully and are still doing so in all sorts of weather and conditions of getting to the individual posts.

There are thousands of observers doing the job voluntarily, and there is an opening for him if he is one of the voluntary type. The voluntary men put in from 20 to 28 hours a week on a four-hour rota of duty, and there would be more voluntary observers if the working men could afford to do it, as in some cases the employers stop pay for the time a man is on duty with the O.C.

I think if your correspondent, when he is getting into his bed at night, would just think for a moment of the thousands of men standing out doing their bit, helping our boys home after their spot of work, if they are lost or crippled, keeping tabs on "Jerry" coming so that all the services connected with A.R.P. can function and sirens sound so that people can take shelter if they want to—he might form a different opinion regarding us overpaid observers. But if he is still in doubt he must belong to a class I know; the class who join because there is some pay, and also because there may be a chance of exemption from other service. I can assure your correspondent there is a waiting list here for the O.C., and if he would send his address through your paper I would like to tell him a few home truths. In the meantime we shall still carry on, smiling and grousing. KEEN OBSERVER.

Even Observers Must Eat

I FEEL that "Observing Enquirer's" letter *re* paying the Observer Corps absolutely demands an answer.

Is he aware that an observer post is manned for 24 hours per day? This means that during daylight hours men must give up their ordinary work to perform the duty. Surely it is not too much to ask that these men should be partly recompensed for loss of earnings. If it was not for the work of the Observer Corps the bill for enemy damage would rise to still higher "astronomical proportions."

It may be a strange idea to "Observing Enquirer" to be informed that even an observer possesses a stomach.

OBSERVER.

On Different Footing from Home Guard

I DO not know in what part of the country your correspondent "Observing Enquirer" resides, but in this district at any rate the whole-time observers have, in most cases, to depend for their living on their 48 hours at 1s. 3d. per hour.

Part-time observers also, hereabouts, are for the most part working men who could not afford to spare the time unless they were paid for it.

The observer is not on the same footing as the Home Guard, inasmuch as the former is given appointments which he must at all costs keep, whereas the Home Guard, while he is expected to attend practices, etc., when possible, is at the same time told that his own occupation must take precedence except in case of national emergency, such as invasion.

Those observers who are independent financially can, and in many cases do, refund their remuneration to the Observer Corps funds. In any case this type of observer would lose a substantial portion of his 1s. 3d. per hour to the income tax collector. It might be mentioned that many observers joined the Corps years before the war or remuneration started, and were not in those days considered particularly smart because they put in some time for no reward. Finally, if "Observing Enquirer" had ever put in a spell of four hours standing in the snow from 1 a.m. to 5 a.m., with a three-mile tramp in a blizzard preceding and following the aforesaid spell, he would probably consider that 5s. had, to say the least of it, been well earned. PART-TIME OBSERVER.

More Points for Consideration

WITH reference to "Observing Enquirer's" letter of 6th inst. As an ex-observer of several years' standing, I should like to make a few points clear.

At least 80 per cent. of the personnel were enrolled some time before the "crisis" periods and were all voluntary members doing a very important job of work. With regard to the "staggering" (??) amount of pay they receive, they most certainly did not ask for it. In fact, their attention was first drawn to it by the B.B.C. announcement.

The expenditure incurred by the Observer Corps is so small that, when included in the astronomical war expense, it is probably 0.0005 per cent.—a truly colossal amount! Also part-time members have to pay quite a considerable amount of their earnings to the Inland Revenue. The number of members allowed per "Post" is definitely limited, and there is also a very large waiting list for enrolment. The reason for the temporary reservation must be very obvious to everyone.

Lastly, it seems to me that for all his professed willingness to give free service to the cause "Observing Enquirer" does not seem willing to sign his own name, but prefers to use a *nom-de-plume* instead. P. C. MOODY, R.A.F.V.R.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

Air Vice-Marshal Breese

IT is with regret we have to record the death, in a flying accident, of Air Vice-Marshal C. D. Breese, C.B., A.F.C.

Born at Carshalton, Surrey, in 1889 and educated at the Royal Naval Engineering College, Keyham, and the Royal Naval College, Greenwich, he was commissioned in the Royal Navy in 1909. Turning his interest to the air, he received his wings in 1913 and served as an instructor in theory and construction at the C.F.S. At the outbreak of war in 1914 he was a flight lieutenant in the R.N.A.S., with which he served in France, and was later awarded the A.F.C. for his services. In 1918, after the amalgamation of the air services, he became a lieutenant colonel and was appointed Deputy Director of Training at the Air Ministry. When peace came in 1918 he was granted a p.c. in the rank of wing commander, and after service at home and in India he was promoted to group captain in 1928. From 1930 to 1932 he was in Iraq, and it was for his work during the operations in Kurdistan that he was awarded the C.B.

Sparks and Physics

THERE are openings in the Women's Auxiliary Air Force at present for women of good education as radio operators. Some knowledge of physics would be an advantage, and candidates who have taken the Intermediate B.Sc. would be welcomed if suitable in other respects. Women of the right stamp would find the work congenial. They should have alert minds, be self-reliant and not liable to be flurried. Their duties would be of a confidential nature. Applicants must be between 18 and 35. They must be prepared to serve anywhere, at home or abroad. There will be good opportunities for promotion.

Training Speed-up

ACCORDING to Mr. J. S. Duncan, Deputy Air Minister of Canada, the Empire Air Training Scheme is six months ahead of schedule. It will be remembered that the scheme is a co-operative Empire effort providing for the training of 20,000 pilots and 30,000 air crews a year. Peak figures were to have been reached by spring, 1942. A large number of trained personnel arrived in England recently.

Coming Events . . .

IN a report to the American Society of Photogrammetry Dr. Walter Clark, of the Eastman Kodak Company, remarked that "colour photography will be a distinct aid in spotting troops, gun emplacements, munition dumps and other military objectives which are practically invisible in ordinary black-and-white photographs." Dr. Clark is an authority on the subject.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations. The number after each name indicates the squadron with which the recipient is serving:—

DISTINGUISHED SERVICE ORDER.

Flt. Lt. Eric Clive LE MESURIER, D.F.C.

Act. Sqn. Ldr. P. C. PICKARD, D.F.C.—No. 311 (Czech).

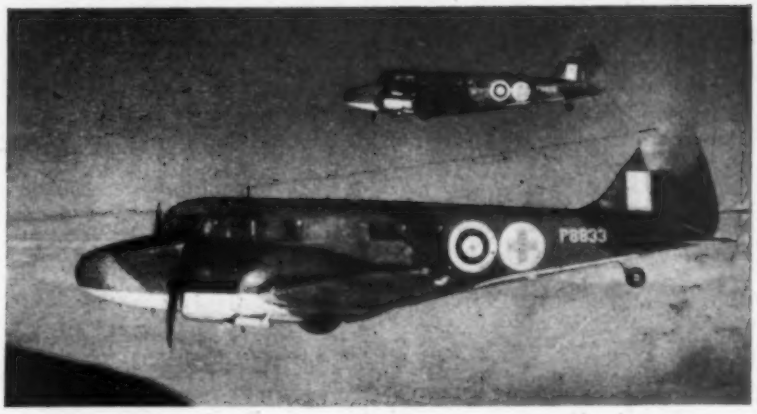
SECOND BAR TO THE DISTINGUISHED FLYING CROSS.

Flt. Lt. Alistair Lennox TAYLOR, D.F.C.

BAR TO THE DISTINGUISHED FLYING CROSS.

Act. Flt. Lt. D. A. P. MCMULLEN, D.F.C.—No. 151.

F/O. J. J. O'MEARA, D.F.C., No. 91 Squadron.—This officer has performed excellent work as a fighter pilot in the many and varied missions which have been allotted to him. On a recent occasion he led an offensive operation which extended as far as Holland, and in which troops and a gun-post were machine-gunned; an armed ship was also attacked. F/O. O'Meara has now destroyed at least eleven enemy aircraft. He has set an excellent example.



TRAINER CONVERSION: Airspeed Oxford ambulances above the clouds.

DISTINGUISHED FLYING CROSS.

Act. Wing Cdr. S. C. ELWORTHY, A.F.C.—No. 82.
Sqn. Ldr. W. R. FARLEY.—No. 419 Flight.
Sqn. Ldr. Dudley George LEWIS.—No. 64.
Sqn. Ldr. Peter STEVENS.—No. 11.
Act. Sqn. Ldr. Ned Charles HARDING.—No. 58.
Act. Sqn. Ldr. Frazer Apsley HARTE.—No. 107
Act. Sqn. Ldr. G. C. O. KEY, R.A.F.O.—No. 105.
Act. Sqn. Ldr. Russel John OXLEY.—No. 50.
Flt. Lt. Hugh James Walter BLACK.—No. 82.
Flt. Lt. James Nigel Watts FARMER.—No. 502.
Flt. Lt. John Seymour SHERWOOD.—No. 144.
Lt. Johan Daniel Wilhelm HUMAN.—No. 40. South African Air Force.
Act. Flt. Lt. S. W. R. HOWELL, R.A.F.V.R.—No. 49.
F/O. G. L. CHESHIRE, D.S.O., R.A.F.V.R.—No. 102.

FROM FIGHTER TO FORTRESSES: Air Chief Marshal Sir Hugh Dowding (left) examining auxiliary fuel tanks at the Boeing works during a recent visit. Sir Hugh, who last year was A.O.C.-in-C. Fighter Command, is now on a special mission for the Ministry of Aircraft Production.

P/O. Kenneth Douglas BRANT, R.A.F.V.R.—No. 10.
P/O. Allan BRIDSON.—No. 10.
P/O. Raymond Newport PEACE.—No. 102.
P/O. Charles David RASH.—No. 115.
P/O. Peter Bettley ROBINSON.—No. 78.
P/O. Irving Stanley SMITH.—No. 151.
P/O. Vernon Richard SMITH.—No. 144.
P/O. R. G. WHITEHEAD, R.A.F.V.R.—No. 9.

Wing Cdr. G. R. A. ELSMIE, No. 114 Squadron.—At dusk one day in February, 1941, this officer led a section of three aircraft on an attack on an objective at Den Helder. As the target area was small, the attack was carried out from a very low level and, in spite of adverse weather and poor visibility, the main objective was successfully bombed, while two searchlights were extinguished by machine-gun fire.

Texel aerodrome was afterwards machine-gunned from a height of only 300 feet; a ship off Texel was also machine gunned. Wing Cdr. Elsmie's careful preparation for the flight, and his courage and determination throughout, contributed largely to the complete success of the operation.

Act. Sqn. Ldr. E. G. JONES, No. 80 Squadron.—In February, 1941, this officer was the leader of a formation of 27 aircraft which encountered an enemy force of 19 heavy bombers escorted by at least 30 fighters, in the neighbourhood of Himara, Albania.

Sqn. Ldr. Jones deployed his formation with great skill and, in the ensuing engagement, at least 27 of the enemy's force were shot down. He has led his squadron with great skill and success on most of the patrols carried out over the Greek front, displaying courage and determination throughout. He has personally destroyed six enemy aircraft.

Flt. Lt. R. N. CULLEN, No. 80 Squadron.—In February, 1941, this officer was pilot of one of a formation of aircraft which attacked a large force of enemy bombers escorted by at least 50 fighters. Displaying remarkable skill, Flt. Lt. Cullen shot down five of the enemy's aircraft in the ensuing action. He has now destroyed 11 enemy aircraft and has consistently shown great resource and courage.

F/O. G. E. WESTON, No. 50 Squadron.—One night in February, 1941, F/O. Weston was detailed to attack an enemy vessel lying in the dock at Brest. Owing to extreme darkness and exceptional searchlight and anti-aircraft opposition, great difficulty was encountered in locating the target. Although his starboard engine failed, F/O. Weston persisted in his search and, in the face of an increasingly heavy and accurate barrage, eventually located his target and pressed home his attack with a full load of bombs.

On the return journey, while over the English Channel his engine picked up but again failed. By skilful handling of his aircraft, however, he succeeded in reaching his base where he landed safely. He displayed outstanding gallantry, skill and determination throughout.

P/O. J. MILLS, No. 115 Squadron.—In February, 1941, this officer was the rear gunner of an aircraft engaged in a bombing operation over enemy occupied territory. Whilst over the aerodrome at Morlaix a Messerschmitt 110 was encountered, and P/O. Mills skilfully directed his pilot into an attacking position and then, with great coolness and skill, shot down the enemy aircraft. Since September, 1939, this officer has participated in numerous operations and has displayed determination and gallantry on all occasions.

Sqn. Ldr. J. H. LITTLE, No. 219 Squadron.—This officer has commanded the squadron since May, 1940. He has carried out numerous operational flights by night, and on one occasion he succeeded in shooting down a Dornier 17. His ex-

SERVICE AVIATION (Continued)

cellent leadership has contributed materially to the operational efficiency of the squadron.

F/O. J. WADDINGHAM, No. 141 Squadron.

F/O. Waddingham and Sgt. Cumbers have been employed as pilot and air gunner respectively on numerous operational sorties at night. One night they destroyed a Heinkel 111, and another is believed to have been shot down into the sea. This officer and airman have displayed great courage and devotion to duty at all times, often under most adverse weather conditions.

DISTINGUISHED FLYING MEDAL.

Sgt. Frank ARCHER, R.A.F.V.R.—No. 82.
Sgt. George ATKINSON.—No. 151.
Sgt. Geoffrey Maurice BATES, R.A.F.V.R.—No. 49.
Sgt. Edmund George CABAN.—No. 18.
Sgt. Hubert Victor CRUM, R.A.F.V.R.—No. 50.
Sgt. Gerald Bryan DAWKINS, R.A.F.V.R.—No. 83.
Sgt. Oswald FALKINGHAM.—No. 58.
Sgt. George GUEST.—No. 58.
Sgt. Jack HOWELL.—No. 144.
Sgt. Joseph Frank Stevenson LAWLEY.—No. 47.
Sgt. Philip Samuel MARRIOTT, R.A.F.V.R.—No. 115.
Sgt. Hugh Williamson MARTIN.—No. 78.
Sgt. Douglas Spencer MATTHEWS.—No. 144.
Sgt. Henry Louis MOODY.—No. 149.
Sgt. Gilbert Kenneth MUIRHEAD.—No. 110.
Sgt. Thomas Reginald NIXON.—No. 51.
Sgt. A. J. S. OLLER, R.A.F.V.R.—No. 115.
Sgt. Charles Francis PLIMMER.—No. 107.
Sgt. Arthur SAYNER.—No. 58.
Sgt. Ernest SHAW.—No. 102.
Sgt. Robert William SMITH, R.A.F.V.R.—No. 61.
Sgt. A. B. CUMBERS, R.A.F.V.R.—No. 141 Squadron.—*For citation see F/O. J. Waddingham.*

THE KING has been graciously pleased to approve the following awards:—

GEORGE CROSS.

Sgt. R. M. LEWIN.—In November, 1940, Sgt. Lewin was the captain of an aircraft on a night bombing mission against Italy. Shortly after the take off the aircraft began to sink and crashed into a hillside where it burst into flames. Sgt. Lewin extricated himself and saw three of his crew of four climbing out of the escape hatch. He ordered them to run clear. He then ran round the blazing wing, in which full petrol tanks were burning, and crawled under it to rescue his injured second pilot. Despite his own injuries—a cracked kneecap and severe contusions on the face and legs—he dragged and carried the pilot some forty yards from the aircraft to a hole in the ground where he lay on him just as the bombs exploded. This superbly gallant deed was performed in the dark and under most difficult conditions and in the certain knowledge that the bombs and petrol tanks would explode.

GEORGE MEDAL.

The Rev. S. W. HARRISON.—One night in November, 1940, an aircraft crashed and burst into flames about three miles from the aerodrome, and, although it was not his duty to do so, Mr. Harrison boarded the ambulance which was proceeding to the scene. On arrival, he immediately plunged into the wreckage and, despite the scorching heat and exploding machine-gun bullets, commenced to drag a member of the crew from the burning debris. He then supervised the work and led the fire picket, himself extricating a second member of the crew and assisting to remove a third. Further efforts were unavailing, however, as the remaining members of the crew were completely buried under the wreckage. Throughout he displayed the utmost courage and an entire disregard for his own safety.

Flt. Lt. D. C. SMYTHE, R.A.F.O., and P/O. G. RYDER.—One night in December, 1940, Flt. Lt. Smythe, P/O. Ryder and a sergeant comprised the crew of an aircraft which crashed and caught fire shortly after taking off. Flt. Lt. Smythe and P/O. Ryder managed to extricate themselves from the wreckage, but the sergeant was trapped in his cockpit. In spite of the fire and exploding incendiaries, and knowing that there were bombs which had not exploded, the two officers immediately re-entered the crashed aircraft and succeeded in extricating the trapped airman. Both these officers displayed great courage and a complete disregard for their personal safety.

F/O. K. L. G. NOBBS, R.A.F.V.R.—One night in November, 1940, an aircraft caught fire in the air and crashed in the vicinity of an aerodrome. F/O. Nobbs hastened to the scene of the accident and, although the aircraft was burning fiercely and machine-gun bullets were flying in all directions, he at once entered the wreckage. He succeeded in pulling out the trapped air gunner, and after carrying him to a safe distance extinguished his burning clothing just before the petrol tanks exploded. Although the air gunner subsequently died of his injuries, F/O. Nobbs displayed the utmost courage and an entire disregard of danger in his efforts to save his life.

L.A/C D. NELSON.—In October, 1940, an aircraft crashed and burst into flames at Kamaran Island. The air gunner was thrown clear and L.A/C. Nelson shielded his body with his own from flying debris. Then, regardless of personal danger, he crawled underneath the burning wreckage and dragged out the observer, who was seriously injured, and put out his burning clothing. Undaunted by the explosion of the petrol tanks, verey lights and bullets, which were exploding in all directions, he displayed conspicuous bravery in making repeated attempts to extricate the pilot, but failed owing to the intense heat and bursting ammunition.

A/C.2 W. J. WHYTE.—In October, 1940, an aircraft crashed and burst into flames. A/C.2 Whyte immediately ran to the scene, in an adjoining field, and found that both the main planes and the fuselage were on fire and that ammunition was exploding. Noticing that one of the pilots appeared to move, this airman, with complete disregard for his own safety, crawled on hands and knees into the damaged cockpit and dragged him clear. Bottles of oxygen were exploding, and A/C.2 Whyte received a blow on the head, temporarily lost his sight and collapsed. Unfortunately the rescued pilot was found to be dead, otherwise this airman's gallant action would undoubtedly have saved his life.

P/O. John Tregonwell DAVISON, R.N.Z.A.F.
For citation see Sgt. Brazier below.

B.E.M.

Sgt. G. W. BRAZIER.

P/O. Davison was the pilot and Sgt. Brazier the wireless operator-air observer of an aircraft which took part in a bombing attack on two heavily armed merchant vessels off the Danish coast. P/O. Davison was wounded in the foot and thigh, but succeeded in flying his aircraft back to base. Owing to severe damage sustained to the hydraulic gear, he was compelled to make a crash landing, not knowing that a bomb remained hung on the rack. The bomb exploded on landing, severely wounding the rear gunner, and setting the aircraft on fire. P/O. Davison and Sgt. Brazier jumped clear, but then discovered that the rear gunner was still in the aircraft. Regardless of the fire and the likelihood that the petrol tanks might explode, they succeeded in extricating the wounded rear gunner from the rear cockpit and dragging him to safety. By their courage and gallantry they undoubtedly saved the life of the rear gunner.

Sgt. A. W. WOOD.—On a night in November, 1940, an aircraft, while engaged in an operation off the north-west coast of Ireland, developed engine trouble and was compelled to come down on to the sea about five hundred yards from the shore. Heavy seas were running at the time, but dinghies were launched and finally manned, with the exception of the captain of the aircraft and a member of the crew who were swept into the sea, the captain being lost. One dinghy drifted on to the rocks, and with great difficulty the occupants, amongst whom was Sgt. Wood, managed to climb up them, being cut and bruised in the attempt. The second dinghy was now in considerable difficulty, having been swept over the rocks in a partially deflated condition. Sgt. Wood, observing the danger to the occupants, stripped off his clothing, donned a flotation jacket and swam for the shore with the intention of securing aid. The sea carried him on to a rock on which he obtained a hand hold, and he afterwards succeeded in climbing the cliffs. To obtain help he ran for about a mile partly through a railway tunnel, on his bare feet, and returned with a sergeant and infantrymen who improvised a rope of blankets and rescued a number of the crew of the aircraft. During the process, however, the rope broke and an R.A.F. officer fell back into the sea, but Sgt. Wood dived into the water and supported him until he was joined by another member of the rescue party, when they succeeded in bringing this officer ashore. Six hours later an officer succeeded in swimming out with a rope which enabled those left on the rocks to be rescued by means of a breeches buoy.

PRESENTATION PIECE: Air Vice-Marshal Janousek handing to General de Gaulle a model of a Spitfire made from a Messerschmitt shot down by Czech pilots.

Prisoners of War

NEXT-OF-KIN, if able to identify the men from the information published, are requested to advise the Casualty Branches of the Services concerned, forwarding Regimental or any other details.

The following is the latest list of British prisoners of war as received from enemy sources:—

IN GERMAN HANDS

Sgt. A. C. FOTHERINGHAM, Dundee.
Sgt. T. F. KEELEY, Ashton Road, Southport, Lancashire.
Sgt. A. BOCKING, Toronto Road, Gillingham, Kent.
Sgt. M. F. HURLSDON, Broomfield Road, Coventry.
Sgt. D. H. GILBERT, Wellingbofough, Northants.
P/O. C. R. HUBBARD, home address unknown.
Sgt. F. C. BAILEY, Birchfield Road, Fallowfield, Manchester.
Sgt. DICKSON, Rydal Street, West Hartlepool.
Flt. Lt. T. M. LOCKYER, Hamilton Road, Chorley, Lancashire.
Sqn. Ldr. F. J. KEAST, Clements Lane, Haverhill, Suffolk.
F/O. E. N. BAKER, Kandalla, Wellington, New Zealand. (It is requested that Mr. S. Handford, 33, Davenport Park Road, Stockport, be informed.)
P/O. K. S. MCMURDY, Greet Road, Lancing, Sussex.
Sgt. D. W. DAVIS, Francis Street, Pontardawe, Glamorgan.
Sgt. D. H. BERNARD, Eldred Road, Childwall, Liverpool.
Cpl. A. J. CAMERON, Grendon Street, High Wycombe, Bucks.
P/O. J. E. RUSSELL, address unknown. (Wounded, in hospital.)
Sgt. W. JESSOP, address unknown. (Wounded, in hospital.)

London Gazette

Royal Air Force

Air Ministry, March 11, 1941.

The follg. promotions are made with effect from March 1, 1941.

General Duties Branch.

Group Capts. to be Air Comdres. (temp.):—C. O. F. Modin, C.B.E., D.S.C., H. K. Thorold, D.S.C., D.F.C., A.F.C., E. L. Howard-Williams, M.C., H. S. Kerby, D.S.C., A.F.C., F. W. Walker, D.S.C., A.F.C., F. J. Vincent, D.F.C., A. Durston, A.F.C., H. E. P. Wigglesworth, D.F.C. E. B. C. Betts, D.S.C., D.F.C., G. H. Boyce, A.F.C., H. W. L. Saunders, M.C., D.F.C., M.M., L. N. Hollinghurst, O.B.E., D.F.C., A. P. M. Sanders, R. P. M. Whitham, O.B.E., M.C., L. G. Le B. Croke, C.B.E., P. F. Fullard, C.B.E., D.S.O., M.C., A.F.C.

Wing Cdrs. to be Group Capts. (temp.):—J. R. Dand, M.B.E., K. H. R. Elliot, D.S.O., C. F. le Poer Trench, J. R. Bell, D.F.C., R. Pyne, D.F.C., J. M. Glaisher, D.F.C., V. P. Feather, N. C. Saward, W. Sanderson, A.F.C., G. C. Blaiden, C. L. Lea-Cox, W. E. Purdin, R. Grice, O.B.E., D.F.C., J. A. McDonald, E. D. H. Davies, J. L. Kirby, J. L. Airey, D.F.C., D. d'H. Humphreys, J. W. Turton Jones, M. H. Ely, B. E. Embry, D.S.O., A.F.C., H. F. V. Battle, O.B.E., D.F.C., J. B. H. Rogers, F. G. A. Robinson, D.F.C., T. Humble, A. F. James, H. J. Gemmel, A. Leach, M.C., H. G. Rowe, D.F.C., D. D'A. A. Grey, D.F.C., A.F.C., A. F. Scroggs, P. J. R. King, G. H. Russell, D.F.C., A. R. Wardle, A.F.C., F. L.

SERVICE AVIATION (Continued)

Pearce, D.S.O., D.F.C., C A. Horn, H. A. Haines, O.B.E., D.F.C., J. N. Boothman, A.F.C., F. W. Long, J. D. I. Hardman, O.B.E., D.F.C., G. P. H. Carter, G. L. Carter, A.F.C., E. A. Blake, M.M., A. N. Webster, A.F.C., E. D. Barnes, A.F.C. Sqn. Ldrs. to be Wing Cdrs. (temp.):—C. S. Wynne-Eyton, D.S.O (ret.), D. J. Alvey, G. E. Valentine, D.S.O., N. C. Hendrikz, H. B. Wrigley, R. N. Clarke, D.F.C., N. C. Walker, A. H. Garland, H. A. Simmons, A. W. S. Matheson, D. M. Lynch-Staunton, T. J. Macdermot, C. G. Skinner, R. H. Jones W. A. J. Satchell, W. R. Wills-Sandford, H. Eeles, F. A. Pearce, A. V. Bax, A.F.M., A. D. Messenger, S. E. R. Shepard, J. G. Giles, D. W. Reid, D.F.C., H. W. Marlow, A.F.C., H. A. V. Hogan, D.F.C., C. N. Carpenter, J. W. B. Judge, C. C. McMullen, E. M. Donaldson, D.S.O., J. M. Freeman, C. W. M. Ling, D. M. Somerville, G. R. Brice, M. W. S. Robinson, R. G. C. Arnold, F. L. White, W. E. Oulton, J. O. W. Oliver, D.S.O., D.F.C., J. L. H. Fletcher, S. E. Mackenzie, N. E. Morrison, A.F.C., L. F. Brown, W. P. Welch, H. R. A. Edwards, J. C. Larking, D.F.C., R. A. Casey, D. G. Keddie, J. M. D. Ker, W. F. C. Hobson C. J. Giles, R. Cleland, D. H. Marsack, G. T. Jarman, F. C. Seavill, E. A. Douglas-Jones, H. R. Graham, G. A. L. Manton, J. J. Zwaenstein, J. O. Willis, S. F. Godden, R. C. Geakell, E. W. Whitley, D.F.C., A. L. Christian, G. F. Wood P. H. Hamley, A.F.C., R. K. Brougham, G. J. L. Read, A. G. F. Stewart, A. A. Adams, K. Lea-Cox, H. McC. White, M. D. Crichton-Biggie, P. Bathurst, W. E. Rankin, W. T. H. Nichols, S. C. Widdows, J. A. Dixon, A. W. Vincent, R. A. R. Rae, H. G. Blair, R. H. Harris, J. D. Miller, M. H. Dwyer, A. McD. Bowman, D.F.C., C. S. Moore, D. Addenbrooke, W. E. Cameron, J. J. A. Sutton, D.F.C., J. W. A. Hunnard, O. A. Morris, L. W. Burgess, R. Faville, J. M. Warfield, R. C. Richmond, J. G. Cardale, D. I. P. Macnair, N. A. R. Halliday, A. A. Saw, G. A. Bartlett, Q. W. A. Ross, J. H. A. Chapman, R. N. McKern, J. C. Sisson, D.F.C., R. V. Alexander, H. T. Bennett, M. W. L'I. La V. Baker, R. H. Maw, C. P. Villiers, J. C. Macdonald, D.F.C., R. F. Smith, W. H. Jones, F. W. Dixon-Wright, J. Grandy, E. F. Porter, F. H. Tyson, M. F. D. Williams, T. F. U. Lang, R. Sorel-Cameron, J. Worrall, D.F.C., W. P. Sutcliffe, D.F.C., R. C. M. Collard, D.F.C., N. G. Goodman, R. H. A. Leigh, J. N. H. Whitworth, D.F.C., G. P. Woodhouse, A. W. Geoghegan, J. S. Sabine, D.F.C., P. L. Harris, D.F.C., A. Threapleton, T. A. B. Parselle, P. S. Gomez, M. B. Hamilton, W. S. P. Simonds, W. P. Harvey, D. V. Johnson, R. S. Ryan, F. D. Terdrey, S. P. A. Palmore, D. I. Coote, H. R. Allen, H. J. Kirkpatrick, H. P. Jenkins, D. R. Evans, A. N. Combe, A.F.C., G. A. Walker, F. G. Frow, J. P. Cecil-Wright, C. R. D. L. Lloyd, P. R. Robinson, W. B. Brotherhood, P. W. Bale, W. G. Bannister, J. R. A. Peel, D.F.C., R. T. Gething, A.F.C., E. C. Kidd, A.F.C., A.F.M., W. S. Jenkins, H. G. Lee, D.F.C, A.F.C., K. R. Warton, D. G. Lewis, I. G. Mackay, J. F. Hobler, A. J. Biggar, E. S. Butler, R. H. Young, L. G. Levis, R. G. Bowditch, R. H. Shaw, E. B. C. Davies, E. D. MacK. Nelson, J. H. Hill, C. G. Lott, D.S.O., D.F.C., H. G. L. Allsop, P. E. Hadow, T. Q. Horner, M. H. Rhys. Flt. Lts. to be Sqn. Ldrs. (temp.):—G. F. Watson-Smyth (Capt., D.C.L.I.), V. R. Oats, E. W. Martin, A. T. Irvine, D. I. C. Eyres, N. W. Wright, K. L. Ashfold, C. E. Slee, A.F.C., M. H. T. Cooke, L. Maxwell-Muller, J. H. Sindall, C. M. M. Grece, D.F.C., W. M. Bisdee, J. R. Davenport (Capt., R.A.), J. A. Field, C. B. B. Wallis, H. B. Johnson, F. J. Kelly, A. C. Rabagliati, D.F.C., R. H. A. Ironside, R. F. H. Clerke, G. de L. Harvie, R. J. P. Prichard, C. H. Simpson, A. M. Taylor, W. I. C. Inness, V. C. Darling, E. Culverwell, G. Burges, D.F.C., R. P. M. Gibbs, A. M. Bentley, W. P. Shand, P. B. Chamberlain, W. H. Ingle, R. P. R. Powell, D.F.C., P. M. Astley, J. H. Humpris, J. B. Tait, D.F.C., O. Godfrey, R. J. M. Bangay, M. G. Stevenson, O. J. M. Barron, J. W. Fordham, H. R. Goodman, C. D. S. Smith, D.F.C., M. G. F. Pedley, G. Lowe, D.F.C., J. G. Towle, W. A. L. Davis, J. H. Greswell, W. G. Moseby, M. W. B. Knight, C. E. Drapper.

Technical Branch.

Wing Cdrs. to the Group Capts. (temp.):—T. O. Clogstoun, J. T. Paine, J. H. Winch, G. T. H. Pack, D. W. Clappen, G. W. Birkinshaw, R. D. Starley, M.C., R. J. M. de St. Leger, C. N. H. Bilney, O.B.E., R. Reay-Jones, C. W. Weedon, K. L. Boswell, O.B.E., A. E. Case, H. Nelson, M.B.E., T. G. Bird, G. Combe, J. W. Lissett, E. M. Drummond, J. A. Elliott. Sqn. Ldrs. to be Wing Cdrs. (temp.):—E. R. Pearce, O.B.E., N. C. S. Rutter, W. H. Husbands, T. N. Coslett, A. L. Holland, F. C. Daubney, C. H. B. Bullock, A. McIlwaine, J. Goodhart, R. G. Shaw, W. N. Elwy-Jones, W. S. Reed, J. J. Murphy, W. L. Boulbrook, F. E. Stokes, G. L. Best, D. A. Gibson, A. Pyke, R. H. E. Emson, G. E. Watt, A. T. Monks, J. K. Rotherham, C. F. S. Fraser, M. K. D. Porter, C. L. Dann, W. M. Keddie, C. C. Morton, G. H. Foss, A. H. Fear, A. P. Chamberlain, H. M. Russell, A. G. Powell, W. F. Beckwith, G. N. Hancock, R. G. Stone, D. Price, R. R. Fairweather, T. G. Young, W. L. Ash, J. R. MacLachlan, W. D. Woods, J. C. Pope, E. Shipley, H. G. Leonard-Williams, H. W. Dean, G. L. S. Griffith-Jones, E. C. Harding, L. D. Dadswell, R. H. Becker, Flt. Lts. to be Sqn. Ldrs. (temp.):—R. Best, E. T. McKeown, W. M. E. Cannock, T. Wilson.

Administrative and Special Duties Branch.

Flt. Lt. to be Sqn. Ldr. (temp.):—W. I. G. Kerby.

Equipment Branch.

Sqn. Ldrs. to be Wing Cdrs. (temp.):—T. A. Head, F. G. Lee, L. F. Oldridge, M. H. Robinson, A. E. Evans, D.F.C., J. W. Hunt, R. B. Horstmann, H. A. Wrigley, A. W. Rule, C. M. P. Hartley, G. Matthews, M. J. Scott, P. Dennehy, B. G. Pool, F. C. Read, J. E. Reynolds, R. G. Seymour, A. J. Howell. F/Os. to be Flt. Lts. (temp.):—R. J. T. Beattie, H. J. S. Anderson, J. O. Gale, A. McI. Peacock, R. W. Donaldson, P. J. George, P. H. Curtis, S. H. Latham, J. D. E. Davies, J. S. Hepburn, D. M. Gilchrist, B. G. Dickinson, C. S. Johnson, B. C. R. Edrupt, L. R. Mumby, B. J. May, D. P. Singleton, D. M. Bidwell, E. A. Darnell, C. B. Iliffe, W. F. M. McDonagh, R. A. S. Ritchie, E. A. L. Wakely, M. B. Cooper, J. W. Noble, P. R. M. Groom, R. H. Mason, F. S. Coventry.

Accountant Branch.

Sqn. Ldrs. to be Wing Cdrs. (temp.):—R. G. D. Thomas, F. M. Hall, A. L. Derry, J. McL. Murray.

TWIN SERVERS: Sgt. G. Neeson showing his D.F.M. to his twin sister after an investiture at Buckingham Palace.

Medical Branch.

Sqn. Ldrs. to be Wing Cdrs. (temp.):—T. W. Wilson, L.R.C.P. and S.; R. Thorpe, M.R.C.S., L.R.C.P.; P. B. L. Potter, M.D., Ch.B., D.P.H., D.T.M. and H.; G. W. Paton, M.B., Ch.B., D.P.H.

Reserve of Air Force Officers

General Duties Branch.

Sqn. Ldrs. to be Wing Cdrs. (temp.):—H. I. Dabinett, R. C. H. Crosthwaite, L. J. Neale. Flt. Lts. to be Sqn. Ldrs. (temp.):—G. C. Walker, A. N. Kingwill, A.F.C., A. L. R. Duke, G. M. Cox, M.C., A.F.C., F. W. Moxham, G. D. Middleton, D. G. Allison, P. V. Williams, R. L. Burnett, G. H. Walker, G. H. W. Selby-Lowndes, F. A. Wardell, J. A. Harris, L. H. Snelling, A.F.C., W. E. Hooper, M. V. Gibbon, A.F.C., A. N. I. Worger-Slade, J. D. H. Slade, A. H. Abbott, D. H. V. Craig, E. H. Coleman, H. R. Black, A.F.C., W. E. Casley, A. D. Annand.

Technical Branch.

Flt. Lts. to be Sqn. Ldrs. (temp.):—W. G. Preston, D.F.C., H. Preston, W. A. E. Featherstone, L. E. Vine, H. Walker, R. W. Jackson.

Royal Air Force Volunteer Reserve

General Duties Branch.

Flt. Lt. to be Sqn. Ldr. (temp.):—J. H. M. Smith.

Technical Branch.

Flt. Lts. to be Sqn. Ldrs. (temp.):—J. R. Brown, D.F.C., R. J. E. Haynes, F. C. T. Rowe.

Equipment Branch.

F/Os. to be Flt. Lts. (temp.):—E. M. Milling, H. W. Newstead, T. G. P. Hidson, R. A. J. Horne, R. S. W. Macfarlan, L. D. Neeves, H. B. Whissell, S. W. Yardley, G. M. Ellcart, D.F.C., J. S. Thomas, A. Beare, D. A. Doughty, T. G. Rateliff, A. L. Smith, G. P. Stevens, W. E. G. Vaughan, P. H. Riggs, A. L. Allen, M. Bowles, C. D. King, J. Moorhouse, K. V. McKenzie, J. G. Davis, C. W. S. Collins, D. R. S. P. Quin, A. C. Ridge, A. D. Hadlor, H. G. Hanks, H. W. Heycock, E. D. B. Payne, T. H. Snelling, R. E. W. Little, E. B. Wilson, F. A. H. Small, C. Cooke, R. G. Kingston, E. H. Proctor, E. A. Sadler, F. L. Mills, A. H. K. Stevens, A. E. B. Rich, P. H. Youngman, S. R. Fairhead, R. A. Taylor, R. H. Gollan, C. W. Harman, D. F. Hackett, F. H. Farthing, A. L. Godden, H. D. Paterson, J. C. Jordan, A. Jones, J. L. King, H. C. Kendall, J. W. J. Bates, W. B. Paton, C. E. Polack, J. Smith, F. D. Wheeler, R. E. N. Tasker, E. Taylor, J. F. H. Adams, E. J. Vince, C. E. Ball, A. R. Brodie, F. D. Deeley, J. C. Rose, J. R. Slater, W. P. Beddow, A. H. Seymour, E. F. Clear, C. H. Keeble, H. L. Ruse, D. F. Tubbs, E. W. Neech, H. S. Paine, W. A. Steward, J. B. Stewart, A. E. Antill, G. J. Gilbody, R. B. Pavey, G. H. Grasty, F. W. Hamblin, N. C. Kirkham, O. H. Downing, W. R. B. Phipps, R. W. Tyler, G. S. Sawtell, D. F. Williams, F. J. Smith, A. G. Dettmer, H. F. R. Temple, A. H. Grutchfield, H. A. J. Bolwell.

Auxiliary Air Force

General Duties Branch.

Sqn. Ldrs. to be Wing Cdrs. (temp.):—Viscount Carlow, G. Shaw, D.F.C., R. A. Budd. Flt. Lts to be Sqn. Ldrs. (temp.):—B. A. Hewett, M. M. Hutchinson, A.F.C., R. G. Grant-Ferris, G. Greaves, J. M. Shewell, W. J. Leather, D.F.C.

Accountant Branch.

F/Os. to be Flt. Lts. (temp.):—V. R. V. Cooper, P. S. Potter.

Royal Air Force

Air Ministry, March 7, 1941.

General Duties Branch.

2nd Lt. G. H. Briggs, Coldstream Guards, is granted a temp. commn. as P/O. on being employed with the R.A.F. (Jan. 23).

The follg. are granted commns. for duration of hostilities as P/Os. on probn.:—Flt. Sgt.: (Feb. 5) F. N. Heapey. Act. Flt. Sgt.: (Jan. 20) D. Bruce, A.F.M. Sgts.: (Jan. 21) W. T. Gray, D.F.M.; (Feb. 5) R. M. Aldus, W. A. M. Birt; (Feb. 7) C. F. Rose, D.F.M.; (Feb. 8) R. F. Hamlyn, D.F.M.; (Feb. 10) C. F. Fennell, D.F.M.; (Feb. 17) L. Stokes.

P/O. on probn. J. Oliver, D.F.M., is confirmed in his appt. and promoted to war substve. rank of F/O. (Jan. 17).

F/O. J. P. V. Nicholls is granted the war substve. rank of Flt. Lt. (Jan. 1).

The follg. P/Os. are promoted to war substve. rank of F/O.:—(April 7, 1940, sen., July 7, 1939) P. H. Baldwin (substd. for notifn. of Dec. 5, 1940); (June 17, 1940) N. D. Hallifax; (Sept. 3, 1940) H. E. L. Falkus, B. K. L. Fuge, C. P. De L. L. Hulton-Harrop, T. N. C. Rothwell, R. C. Wood; (Nov. 6, 1940) A. H. Deacon, P. E. J. Greenhous, W. A. Scrymgeour-Wedderburn, J. B. Smiley; (Dec. 16, 1940) L. R. Darwen; (Jan. 1) D. R. Keenan; (Feb. 10) A. C. Hamman, D.F.C., E. H. Upton; (March 2) P. M. Dobree Bell, J. C. Fleming.

The follg. P/Os. are granted war substve. rank of F/O.:—(July 13, 1940) P. F. Murch; (Jan. 4) J. T. W. Parnell; (Jan. 5) C. A. Cooke.

The follg. are transfd. to the Technical Branch:—(April 24, 1940) Wing Cdr. J. T. Paine, Sqn. Ldr. (temp. Wing Cdr.) J. D. Rutherford, Sqn. Ldr. T. N. Coslett, Sqn. Ldr. H. W. St. John, D.F.C. (ret.).

F/O. J. B. Wood is dismissed the Service by sentence of General Court Martial (Feb. 19).

Technical Branch.

The follg. are granted commns. for duration of hostilities as F/Os. on probn.:—W/Os.: (Feb. 1, sen. Oct. 28, 1940) A. R. Sheekey; (Feb. 1) W. F. Greenaway; (Feb. 5) W. J. P. Cunningham; (Feb. 6) W. C. H. Oatey. As P/Os. on probn.:—(Oct. 31, 1940) L. G. Blake; (Feb. 1) E. J. Praill; (Feb. 1) P. Crowley, R. F. Corbett, L. T. Wright; (Feb. 10) E. A. Luckhurst. Flt. Sgts.: (Feb. 1) E. V. Bowen; (Feb. 7) E. S. Burrell. Sgt.: (Feb. 1) D. McLean.

The follg. Flt. Lts. are promoted to rank of Sqn. Ldr. (temp.):—(Dec. 1, 1940) S. Lugg, E. N. Rooms, A.F.M.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Nov. 12, 1940, sen. Aug. 23, 1940) C. A. Pope; (Jan. 20, sen. Aug. 16, 1940) W. S. Bow, M.B.E.; (Jan. 20, sen. Aug. 23, 1940) A. Hanglin; (Jan. 31) R. W. Short.

The follg. F/Os. are granted war substve. rank of Flt. Lt.:—(Jan. 1) T. L. Mann; (Jan. 19) F. P. Cotterell.

P/O. on probn. A. W. Darnell is promoted to war substve. rank of F/O. on probn. (Jan. 1).

Balloon Branch.

The follg. are granted commns. for duration of hostilities as P/Os. on probn.:—Flt. Sgt.: (Feb. 8) W. H. Forks. Sgt.: (Feb. 7) R. K. Garside.

Administrative and Special Duties Branch.

The follg. are granted commns. for duration of hostilities as F/O. on probn.:—W/O.: (Feb. 5) G. Wilson. As P/O. on probn.:—W/O.: (Feb. 3) W. R. Scrivener. As Act. P/Os. on probn.:—Sgt.: (Feb. 7) W. H. Eynon. L.A/C.: (Feb. 8) M. Devlin.

P/O. G. W. Sawkins is granted war substve. rank of F/O. (Jan. 25).

Equipment Branch.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Jan. 3) G. Filmer; (Jan. 10) A. S. Thompson.

Accountant Branch.

Act. P/O. on probn. P. C. Dainty is graded as P/O. on probn. (Jan. 4).

F/O. G. A. Cornish is promoted to war substve. rank of Flt. Lt. (Oct. 4, 1940).

The follg. P/Os. are granted war substve. rank of F/O.:—(Jan. 1) W. L. Whittaker; (Jan. 4) E. T. Pratt.

Dental Branch.

Flt. Lt. J. J. Lawson, L.D.S., is promoted to war substve. rank of Sqn. Ldr. (Jan. 21).

SERVICE AVIATION (Continued)

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

Flt. Lt. D Hodson is granted rank of Sqn. Ldr. to Class CC (May 6, 1940).

Sqn. Ldr. F. E. M. Clarke relinquishes his commn. in Class CC on appt. to a commn. in the R.A.F.V.R. (Feb. 22)

Administrative and Special Duties Branch.

F/O F. E. Cowlrick is transfd. to Technical Branch (Aug. 20, 1940).

Royal Air Force Volunteer Reserve

General Duties Branch.

The follg. are granted commns. for duration of hostilities as P/Os. on probn.:—(Feb. 7) J. Cattley. Flt. Sgt.: (Jan. 28) C. J. Rose. Sgts.: (Dec. 25 1940) A. J. Andrews, A. E. Challenger, D. Clive, H. G. Currie, M. E. Gardner, S. Moule, J. G. Owen, H. A. P. Peall, R. W. Stolzie, G. W. Tetlow, F. W. Thompson, C. L. H. Werner, D. A. Barnham, G. Clapperton, D. L. Cropper, J. W. Gee, P. G. C. Gimson; (Dec. 28, 1940) J. M. J. Fryer; (Jan. 20) J. F. P. Matthews; (Feb. 1) H. Lawson; (Feb. 5) D. G. Buchanan; (Feb. 15) G. H. Proctor. L.A/C.: (Nov. 3, 1940) H. A. W. Williams; (Nov. 17, 1940) J. T. Monks, A. C. Stevens-Fox; (Dec. 1, 1940) H. C. Pearce, J. S. Perry, J. M. Wheeler; (Dec. 9, 1940) A. T. Hunt; (Dec. 15, 1940) M. V. Andrew, H. Kitchin; (Dec. 28, 1940) D. W. Hockney; (Dec. 29, 1940) C. F. Page, K. E. Platt, A. B. Brown, J. Prescott; (Dec. 30, 1940) A. N. McKelvie; (Jan. 11) F. S. H. Ford; (Jan. 12) D. F. Hill, C. McLean, R. H. Matthews, R. C. Nesbit; (Jan. 18) A. H. Foord, A. J. G. Jones, V. H. Surplice, R. S. Le Masurier, G. W. Ball, H. Rhoden, J. Simpson; (Jan 25) The Hon. J. E. T. Mansfield, F. H. Raffaelli; (Jan. 26) G. D. N. Sandford, T. Treby, C. M. Fell, G. C. Andrew, H. Van D. Bonney, P. R. Hughes, R. A. Coates, E. C. Durrant; (Jan. 31) G. Kertesz; (Feb. 1) R. Needham D. White; (Feb. 1) R. A. Brown, P. T.-R. Cook, J. T. Hannly, G. H. Kidd, M. E. Potter, F. A. Reiss, G. E. J. Rushbrooke; (Feb. 1) P. R. S. Bird, J. A. T. Garrould, J. Barrett, M. R. Evans, R. H. May; (Feb. 3) D. M. Gossland, W. E. Thomas, G. R. Butcher, D. Coard, A. H. Drummond; (Feb. 8) R. G. C. Rusbridge, J. G. Crampton, G. F. Bundey, M. A. Scott, R. A. Richards; (Feb. 9) A. Eastman, W. J. Mason, H. Brant, J. R. Campbell. As Act. P/O. on probn.:—(Dec. 17, 1940) W. A. Welch.

The follg. are granted commns. for duration of hostilities at P/Os on probn.:—(Dec. 14, 1940) L.A/C.: J. D. Agrell, E. A. Allison, A. S. Baker, R. Bartholomew, J. W. S. Clark, D. W. D. Faint, J. E. F. Griffin, E. G. Haddon, D. L. Petrie, P. Plumridge, A. W. Saunders, L. B. Wilton (substd. for notifn. of Feb. 4 concerning these officers).

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Dec. 4, 1940) A. Payne; (Jan. 1, sen. March 29, 1940) S. P. Hagger; (Jan. 2) V. J. Wheeler, M.C.; (Jan. 14) J. E. D. Holder.

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Aug. 24, 1940) The Hon. B. D. Grimston; (Nov. 4, 1940) R. J. Burleigh; (Nov. 30, 1940) C. D. Brown; (Dec. 21, 1940) E. M. Allies; (Jan. 5) P. B. Verver.

P/O. H. E. Hervey is granted war substve. rank of Flt. Lt. (Jan. 22).

The follg. P/Os. are granted war substve. rank of F/O.:—(Jan. 1) V. W. Hinkley; (Jan. 3) G. W. Cannon; (Jan. 20) L. W. Simpson; (Jan. 21) A. Ingle.

The follg. P/Os. on probn. are transfd. to Administrative and Special Duties Branch.:—(Feb. 14) E. Cohen; (Feb. 17) P. F. Mason; (Feb. 24) H. J. Ketchen.

F/O. W. G. M. B. Broomhall resigns his commn. (Feb. 9).

The commn. of P/O. on probn. A. E. Mepham is terminated on cessation of duty (Feb. 25).

Wing Cdr. F. R. W. Graham, D.S.O., M.C., relinquishes his hon. commn. on termination of employment (Oct. 29, 1939).

Technical Branch.

The follg. are granted commns. for duration of hostilities as F/O.:—(Jan. 20) E. W. Smith. As P/O. on probn.:—(Feb. 10) E. G. Wallis. Flt. Sgt.: (Jan. 10) T. Nicholson. As Act. P/Os. on probn.:—L.A/C.: (Feb. 7) J. A. Ackroyd; (Feb. 7) W. G. Boddington.

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Sept. 9, 1940) H. C. Walmsley; (Sept. 26, 1940) F. A. Kemp; (Dec. 29, 1940) R. McB. Galway; (Dec. 31, 1940) C. F. Croisdale; (Jan. 17) C. S. Hawley; (Jan. 20) A. P. Pearce.

Act. P/O. on probn. H. Tonge is graded as P/O. on probn (Oct. 4, 1940).

F/O. H. J Barton-Chapple is granted war substve. rank of Flt. Lt. (Jan. 1).

P/O. W. W. Wells-Coates is granted war substve. rank of Flt. Lt (Jan. 7).

Balloon Branch.

The follg. are granted commns. for duration of hostilities as P/O. on probn.:—Cpl.: (Feb. 6) A. H. Moore. L.A/C.: (Feb. 1) E. S. Bentley.

The follg. P/Os. are granted war substve. rank of F/O.:—(Jan. 2) J. F. Leeming; (Jan 24) S. H. Claydon, C. R. Beardsley.

The notifn. of Jan 14 concerning P/O. S. Smith is cancelled.

Administrative and Special Duties Branch.

Maj. F. E. M. Clarke, S.U.L., I.A., is granted a commn. as Flt. Lt (Feb. 22).

The follg. are granted commns. for duration of hostilities as Sqn. Ldr.:—(Jan. 20) Wing Cdr. W. G. P. Young, O.B.E. As F/Os. on probn.:—(Oct. 17, 1940) G. Lennie (substd. for notifn. of Nov. 12, 1940). W.Os.: (Jan. 31) A. R. May; (Feb. 6) J. H. Wortley, M.M. As P/Os. on probn.:—(July 10, 1940) A. W. Major; (July 19, 1940) P. Nash; (Oct. 2, 1940) P. B. Burnett; (Oct. 22, 1940) D. T. Lawrie; (Oct. 31, 1940) W. P. G. O'Brien; (Nov. 4, 1940) E. T. Munday; (Nov. 19, 1940) E. Montgomery; (Nov. 25, 1940) W. R. Tapper; (Dec. 1, 1940) O. L. Hancock; (Dec. 2, 1940) R. S. Barnes; (Dec. 7, 1940) A. H. Marsh; (Dec. 17, 1940) G. A. Gillings; (Dec. 27, 1940) J. R. Aldiss, N. Beare, C. H. N. Fensom, P. V. Gale, H. Goodhart, A. D. S. Gordon, B. C. D. Jones, E. M. Ling Mallison, S. A. Oldham, H. T. Le F. Shepherd, G. L. H. Stein; (Jan. 27) H. A. Meredith, M.B.E.; (Jan. 28) G. H. D. More, K. H. Ritchie; (Jan. 31) C. T. O'Callaghan; (Feb. 1) C. G. Graham; (Feb. 4) G. M. Lyne; (Feb. 5) W. Francis, B. N. Holland; (Feb. 6) D. Jeffrey; (Feb. 7) W. L. Allen, G. T. Armstone, H. R. Ashley, J. H. Bairstow, L. Balfry, W. H. F. Barnes, W. J. Bowden, R. J. Bracken, G. C. L. Brigham, E. R. Brown, S. Brown, G. M. Burdett, J. Butler, H. Clements, E. S. Cohn, F. H. G. Collis, R. S. Compton, C. E. B. Cooper, R. P. Crawshaw, J. P. Crowther, F. H. Culpin, H. V. Ellison, S. D. Evans, E. J. Finch, E. F. Greenwood, W. S. Hulme, I. B. Ingall, L. A. Isaacs, A. H. Ives, J. W. Jackson, S. M. Lawry, H. S. Lightbody, W. Long, R. M. W. Loudon, W. K. MacFarlane, E. G. Mackinder, I. Macnab, P. J. May, E. Mayer, F. R. Moore, J. K. Napier, H. A. Newton, R. R. G. O'Brien, E. Odams, A. H. Parker, M. G. Pearson, J. W. Penberthy, A. W. Poupart, K. A. Pugh, W. J. R. Quann, M. B. Rowles, J. G. Staveley Dick, W. S. Stent, R. J. Steer, C. M. Sugden, W. R. Sutton, H. R. Taylor, R. Taylor, F. M. S. Tegner, W. G. F. Thompson, E. S. Till, G. C. M. Tinline, C. F. Trigg, J. H. Turnbull, E. W. Vaughan, J. F. Ward, E. T. Warren, C. B. Waters, S. J. Wilson; (Feb. 8) G. A. C. Badham, M.C., H. E. Biggers, E. R. Bishop, A. C. Boucher, J. P. Condon, N. Illingworth, M. L. Miller, J. Weltman; (Feb. 10) A. Gold, G. R. Western; (Feb. 11) E. H. Crebbin; (Feb. 17) A. S. Holmes, A. D. Maher, J. H. Middleditch, N. Sinclair. Sgt.: (Jan. 12) M. A. Young. L.A/C.: (Dec. 14, 1940) C. H. Vaughan. As Act. P/Os. on probn.:—Sgt.: (Jan. 31) R. H. Clover. A/C.2: (Feb. 7) J. D. Walker.

B. G. Ewing is granted an hon. commn. as Flt. Lt. (Feb. 14).

W. P. Spooner is granted a commn. for duration of hostilities as P/O. on probn. (Nov. 13, 1940) (substd. for notifn. of Jan. 14).

The follg. P/Os. on probn. are confirmed in their appts. and promoted to war substve. rank of F/O.:—(Sept. 19, 1940) H. C. Lavers; (Nov. 27, 1940) R. W. King, H. J. Sweet; (Dec. 4, 1940) W. T. D. Windham; (Dec. 9, 1940) H. G. Boswell; (Dec. 10, 1940) M. F. Cooper; (Dec. 11, 1940) R. A. Davies; (Dec. 14, 1940) M. S. Anthony; (Dec. 19, 1940) F. K. Huxham; (Dec. 22, 1940) G. D. Gibson; (Dec. 26, 1940) W. Yonge; (Dec. 29, 1940) J. C. Kilkenny; (Jan. 9) W. A. Mair; (Jan. 10) C. G. Moore; (Jan. 26) L. M. Dunn, W. J. Breen, L. Monnickendam, E. S. Reding; (Jan. 28) D. O. Lloyd-James; (Jan. 31) G. W. Bone.

The follg. P/Os. are promoted to war substve. rank of F/O.:—(Sept. 19, 1940) R. S. Falk; (Oct. 20, 1940) P. W. Donner, M.P.

The follg. P/Os. are granted war substve. rank of F/O.:—(Oct. 8, 1940) S. Smith, D.S.O., M.C.; (Jan. 1) G. C. Ross-Mumby, H. Baxter, S. P. Williams, A. J. Palmer, E. G. Sharvill, A. E. Herniman, W. S. Ellis, G. Cruikshank, E. A. Latter, B. W. S. Smith, H. D. Curry, R. W. Brander, C. W. P. Selby, C. P. Denby, M.C., F. Adams; (Jan. 2) F. D. J. Silwood, A.F.C.; (Jan. 3) R. G. Warden; (Jan. 4) H. D. Wright; (Jan. 5) H. D. Gunton; (Jan. 6) S. Bosworth-Martin; (Jan. 7) S. Danby; (Jan. 8) L. Bell, F. V. Smith, J. C. Warren, M.C., D.C.M., T.D.; (Jan. 9) C. H. Bell, C.B.E., H. G. Maturin, O.B.E.; (Jan. 10) J. G. Parkin, R. G. Cookson; (Jan. 11) H. Parker, J. E. Clayton, K. O. G. Huntley, B. Stewart-Sandeman; (Jan. 12) H. C. Mathew, Sir R. B. Graham, W. M. Elcke; (Jan. 13) H. L. Wood; (Jan. 14) W. E. Bryan, D.F.C., R. S. Heape; (Jan. 15) P. B. Townsend, O. G. E. McWilliam, J. R. Laing, A. L. Hiscox, D. Skelding, S. E. May; (Jan. 17) A. G. C. Colquhoun; (Jan. 19) F. J. W. Williams, J. E. W. Wheatley, M.C., M. G. Hill; (Jan. 20) O. L. Beater, D.F.C., S. A. Sinner, H. J. Smith, A. T. S. C. Richardson, F. T. Kitchin; (Jan. 21) R. I. H. Isdell-Carpenter; (Jan. 22) F. A. Briggs; (Jan. 23) D. F. Meredith, C. T. E. Smith, G. W. Lightfoot; (Jan. 25) B. F. Savage; (Jan. 26) K. L. Bodenham, S. J. Jordain, M.C., G. Munro-Kerr, E. G. J. Byrne; (Jan. 27) J. T. Hunter, T. C. Clayson, J. E. Hunter; (Jan. 28) A. Sidney-Wilmot, J. McK. Anderson; (Jan. 29) A. E. Morgan; (Jan. 30) Lord G. H. L. Dundas, J. P. Blackman, A. MacNaghton; (Jan. 31) V. C. Morris.

The follg. are transfd. to General Duties Branch:—Flt. Lt.: (Nov. 1, 1940) H. M. Ferreira. F/O.: (Nov. 18, 1940) E. J. Ashby. P/O. on probn.: (Dec. 5, 1940) I. H. Brigers.

The follg. are transfd. to Technical Branch:—F/Os.: (April 24, 1940) G. J. F. Smith, F. Butler; (May 21, 1940) J. W. Sim; (Oct. 7, 1940) J. S. Rowlands; (Nov. 7, 1940) S. C. Williamson. P/Os. on probn.: (July 28, 1940) R. A. V. Dismore; (Aug. 16, 1940) C. E. Prince; (Aug. 24, 1940) E. L. Vaughan; (Aug. 26, 1940) J. Addison; (Sept. 28, 1940) P. G. Smith; (Nov. 11, 1940) K. A. Rowland; (Nov. 25, 1940) R. K. Porter; (Dec. 21, 1940) A. W. H. Phillips; (Jan. 1) R. T. Parry.

F/O. A. R. Smithwick, D.S.O., relinquishes his commn. on return to the Royal Navy (Feb. 18).

P/O. A. F. Falconer relinquishes his commn. on appt. to a commn. in the R.N.V.R. (Jan. 31).

The follg. relinquish their commns. on account of ill-health:—Flt. Lt.: (March 1) A. G. Forbes. P/Os. on probn.: (March 1) J. C. H. le B. Crohr; (March 3) W. E. Clarke.

The follg. resign their commns.:—F/O.: (Feb. 16) P. Sidney. P/O.: (Feb. 20) R. J. Slade. P/O. on probn.: (Jan. 15) E. W. L. Agar.

The commns. of the follg. P/Os. on probn. are terminated on cessation of duty:—(Feb. 8) E. R. Milner; (Feb. 15) J. C. Stephens; (Feb 18) L. Brilliant.

Meteorological Branch.

P/O. on probn. W. E. Tomkin is confirmed in his appt. (Aug. 1, 1940) and promoted to war substve. rank of F/O. (Nov. 23, 1940).

Equipment Branch.

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Nov. 25, 1940) A. J. G. Glock; (Jan. 20) A. Macfarlane, A. W. Tew, A. A. Peterken.

The follg. P/Os. are granted war substve. rank of F/O.:—(Jan. 1) R. Crittenden, T. F. Griffin; (Jan. 10) H. L. Bray; (Jan. 15) A. P. Moore; (Jan. 18) A. R. Crew.

The notifns. of Jan. 3 and Jan. 14 concerning N. R. Melville are cancelled.

Accountant Branch.

W/O. S. Searle is granted a commn. for duration of hostilities as F/O. on probn. (Jan. 3).

The follg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Jan. 4) E. R. H. Scott, P. E. Binnie, R. S. Hartree, J. G. Hayward; (Jan. 6) W. S. Benwell, W. J. Dawson, L. G. Hancock, J. H. Miller, H. O. S. Morgan, H. P. O'Brien, V. L. Powell, D. N. Rabagliati, H. Rapier, D. W. Rollin, J. F. Rowan, F. J. Smith, D. Sturrock, H. E. Wilson, C. F. Winterson; (Feb. 2) P. J. Macduff.

P/O. S. E. Philips is granted war substve. rank of F/O. (Jan. 1).

Medical Branch.

The follg. are granted commns. for duration of hostilities as Sqn. Ldr.:—(Jan. 28) B. Cater, M.B., B.S., M.R.C.S., L.R.C.P., D.P.M. As F/Os.:—(Jan. 28) G. Levy, M.B., B.S., M.R.C.S., L.R.C.P.; (Feb. 7) N. S. Gurrie, M.D., B.Ch., D. M. Roberts, M.B., B.Ch., M.R.C.S., L.R.C.P., T. A. Shaw, M.B., B.S., D. E. Meredith, M.B., B.S., M.R.C.S., L.R.C.P., J. C. Hutchinson, M.B., Ch.B., D. O. Hicks, M.B., B.Ch., C. W. J. Claydon, M.B., B.S., M.R.C.S., L.R.C.P., L. H. Boyd, M.R.C.S., L.R.C.P., A. J. Barwood, M.R.C.S., L.R.C.P., J. L. Morgan, M.B., Ch.B., K. G. Reynolds, L.R.C.P. & S., L. M. A. Reid, L.R.C.P. & S., L.R.F.P.S., W. E. Rigby, M.B., Ch.B., J. S. Hall, M.B., Ch.B., K. Hazell, M.R.C.S., L.R.C.P., D.P.M., J. Greene, M.B., B.S., M.R.C.S., L.R.C.P., H. H. Glatston, M.R.C.S., L.R.C.P., D. R. Sloan, M.B., Ch.B., M. Wynroe, M.B., Ch.B., S. D. Perchard, M.B., B.S., M.R.C.S., L.R.C.P.

The follg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Jan. 23) F. T. Dodd, M.B., Ch.B., E. I. B. Hawes, M.R.C.S., L.M.S.S.A., J. A. Partridge, B.M., B.Ch.; (Jan. 30) K. A. Boughton-Thomas, M.B., Ch.B., E. O. Evans, M.B., B.S., M.R.C.S., L.R.C.P.

Dental Branch.

The follg. are granted commns. for duration of hostilities as F/Os.:—(Dec. 27, 1940) J. L. Hitchman, L.D.S.; (Jan. 7) S. R. Woodcock, H.D.D., L.D.S.; (Feb. 7) S. Iverson, L.D.S., Y. D. Lees, L.D.S., R. G. MacD. Heavenor, L.D.S., N. L. Calvert-Wilson, L.D.S., A. H. Curtis, L.D.S., J. C. Watson, L.D.S., C. W. Holmden, L.D.S., A. C. Allan, L.D.S.

Auxiliary Air Force

General Duties Branch.

The follg. Act. P/Os. on probn. are confirmed in their appts. and graded as P/Os.:—(Oct. 2, 1939) H. S. L. Dundas (substd. for notifn. of April. 26, 1940); (Oct. 30, 1939) B. M. Denny (substd. for notifn. of May 21, 1940); (Jan. 11, 1940) W. J. G. Morgan (substd. for notifns. of June 4, 1940, Feb. 14, 1941).

The follg. P/Os. are promoted to war substve. rank of F/O.:—(Sept. 4, 1940) R. Roberts; (Sept. 21, 1940) T. C. Jackson; (Oct. 30, 1940) B. M. Denny.

Administrative and Special Duties Branch.

The follg. P/Os. are transfd. to Technical Branch:—(April 24, 1940) C. A. Potter (since promoted), A. H. Wood.

Women's Auxiliary Air Force

The follg. are appointed Assist. S/Os.:—(Feb. 1) Sgt. V. L. F. Evans; (Feb. 19) Sgt. J. M. Arnott, A/CW.1 D. Atkinson-Clark, Cpl. E. D. Coulthard, A/CW.2 S. M. Drake-Brockman, A/CW.2 E. J. Elliot, A/CW.1 V. A. Fiske, A/CW.2 J. Haig, A/CW.1 G. M. J. Horsburgh, Cpl. M. C. Landreth, Cpl. R. V. P. Pechey, A/CW.2 E. M. Rae, A/CW.2 K. C. Rees, A/CW.2 M. M. Rudman, A/CW.2 M. I. Watson; (Feb. 22, 1940) A/CW.1, A. M. S. Allan, A/CW.2 Y. J. Campbell-Bruce, Sgt. N. Colville, A/CW.1 J. MacA. Donald, Cpl. E. L. Hay, A/CW.2 J. A. Heath, A/CW.2 J. Kent, A/CW.2 V. M. Mitchell, A/CW.2 E. I. L. Murray, Cpl. J. Peel Nash, A/CW.1 K. C. H. Powell, A/CW.1 M. A. Webster, A/CW.1 A. Wickham.

Assist. S/O F. Beavan relinquishes her appt. (Feb. 6).